JPRS 79786

5 January 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 86

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50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. JPRS 79786	2.	3. Recipient's Accession No.
4. Title and Subtitle WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY, No. 86			5. Report Date 5 January 1982 6.
7. Author(s)			8. Performing Organization Rept. No.
9. Performing Organization Name and Address Joint Publications Research Service 1000 North Glebe Road Arlington, Virginia 22201			10. Project/Task/Work Unit No. 11. Contract(C) or Grant(G) No. (C) (G)
12. Sponsoring Organization Name and Address As above			13. Type of Report & Period Covered 14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

This report contains information on national-level science policies, technology strategies, and research and development programs in West European science and technology in general and specifically in civil technology, with particular attention to transportation, energy, chemical manufacturing, industrial automation and technology transfer. The report will focus primarily on France and the Federal Republic of Germany, but will also cover important developments in Italy, the Netherlands, Sweden and other West European countries.

17. Document Analysis a. Descriptors

WEST EUROPE
Science and Technology
Chemistry
Energy
Industrial Technology
Science Policy
Transportation
Biotechnology
Electronics

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group 01, 07A, 10, 13B, 17

18. Availability Statement: Unlimited Availability Sold by NTIS Springfield, Virginia 22161	19. Security Class (This Report) UNCLASSIFIED	21. No. of Pages 31
	20. Security Class (This Page) UNCLASSIFIED	22. Price

(See ANSI-Z39.18)

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

JPRS 79786

5 January 1982

WEST EUROPE REPORT

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BRIEFS

PROTEIN FROM MICROORGANISMS--The industrial production of protein, the result of West German technology, may become an export commodity. A process development project in this area has now come to a successful conclusion. At present, 300 to 400 tons of protein-rich fodder is being produced at a pilot plant in Frankfurt. The process involves microorganisms capable of breaking down paraffin, alcohol, or cellulose. Methods for the mass production of microorganisms were also developed as part of the project. In addition to protein for fodder, fats, phospholipids, and nucleic acid derivatives can be extracted by a new method for the nondestructive separation of cell materials. In this way, it is hoped that biomass can be refined and used for food production. Several countries are reported to be interested in equipment for protein production. The process will be tested in Egypt with an already completed mobile unit. Agricultural waste will serve as the base material for the production of protein for fodder. A number of companies and research institutes participated in developing the protein technology. The West German Research Ministry supported the project with about 100 million kronor. [Text] [Stockholm KEMISK TIDSKRIFT in Swedish Sep 81 p 21] 9336

CSO: 3102/72

SIEMENS USES GATE ARRAYS IN DISPLAY TERMINAL

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 5 Nov 81 p 7

[Text] Valvo reports that for the first time gate arrays from Valvo and Siemens are being used in the Siemens 9750 data display terminal in place of conventional integrated circuits. The gate arrays assume the function of the central control unit and command of the peripheral instruments. One flat Euroformat subassembly, equipped with about 30 standard TTL [transistor-transistor logic] modules (SSI [small-scale integration] and MSI [medium-scale integration] is combined in a gate array with 40 connector pins. This circuit contains between 600 and 1,200 gate functions. According to Valvo, gate arrays offer considerable advantages, such as longer life, smaller volume and lower weight, less loss of performance, quicker and more error-free assembly of the equipment, the use of the most recent technology and expansion of functions with the same volume.

The previous discrete solution was redesigned in conjunction with the gate array manufacturers. By using existing CAD [computer access device] aids, from logic simulation and emulator comparison to mask control, short realization times can be achieved; Valvo believes that cost-intensive and time-consuming redesigns can be avoided.

Gate arrays consist of between 12,00 and 1,600 gates, arranged in a matrice, and 36 TTL-compatible in- and out-circuits on one chip. They provide a link with the outside world. The desired logic circuits are linked to each other through two-position wiring and tested with a layout check program for agreement with the original schematic diagram.

In Valvo's opinion, gate arrays will be used everywhere in future where a logical design cannot be solved optimally by using software, where an appropriate standard circuit is not available and when an integrated circuit developed specially for the case at hand is not economical because of low production numbers. In the final manufacturing steps the gate array will be tailored specifically for the customer, but it offers the price advantages of mass production and the technical advantages of high integration density, such as high speed, low loss of performance and a high degree of reliability.

9581
CSO: 3102/51

CNET FACILITY TO INDUSTRIALIZE MICROELECTRONICS ADVANCES

Paris ELECTRONIQUE ACTUALITES in French 6 Nov 81 pp 1, 13

[Article by F. Grosvalet: "1.5 micron CMOS Technology Ready to be Industrialized"]

[Text] Grenoble--Eight months after its official inauguration, the Norbert Segart Center (CNS) of CNET is in operation; its programs are oriented toward research and development of MOS VLSI circuits, with the aim of transferring its know-how to industrial users. It now has a pilot line equipped with industrial-type machines (ion implantation, plasma etch, 1/1 photoprojection lithography with automatic alignment, contact masking, electronic masking, PCVD and other film deposition, and so on), which has just started the fabrication of a first batch of 4K NMOS static memories (type 2114), using Eurotechnique technology to check the installations. This shop makes it possible to simulate a complete production line for circuits designed by CNET researchers (alone or in collaboration with industry) so as to be able to transfer to industry a tested fabrication process and a reliable product with a "credible" technology; the check-out of this shop should continue until the end of the year.

We should remember that the objective of CNS is to recover our country's technologic lag by 1985, and to evolve from there toward original micron and submicron technologies using the necessary CAO and fabrication means (for which an ion masker is being studied, among other things); 1984 should see the inception of an 0.8 to 1 micron line, for which fundamental research has already begun.

Within its goals, by the end of 1983, CNS should have a CMOS technology with 1.5 micron lines, ready to be used in industry (in particular, it should be in production in 1984 at MHS and Eurotechnique, two of the privileged partners of CNS). To this end, particular efforts are made on the possibility of using the symbolic implantation method MD-MOS (multi-drain MOS) in CMOS.

In parallel, the microelectronics center at CNET is pursuing research on materials and technologies that are indispensable for perfecting new fabrication methods. Among other things, it is also studying new structures for three-dimensional integration (a good example is the stacked-transistor CMOS inverter, presented at ESSDERC last September, which uses an NMOS technology with two levels of polycrystalline silicon, laser annealing, and selective implantation), recrystallization, and material formation with energy beams.

Beyond this program, CNS is now envisaging new research orientations, notably for solid-state imaging devices (the beginning of next year will see the start of silicon MOS sensors, whose internal preproduction is planned for mid-1983), and for speech synthesis analysis circuits (the logic simulation on a PDP-11, of a circuit which will recognize 50 words, operating on phonemes, is under study). And finally, depending on the limits of integration and the evolution of technologies, programs could eventually also be oriented toward materials other than silicon.

Digital COFIDEC Under Study

But in order to achieve these objectives, it is not enough to have the will: one also needs the means, and the future of CNS could depend strongly on whether or not a second stage of projects will be undertaken, whose cost should be equal to that of the first (19 MF), initially planned for 1982 (its simple delay could even cancel the effort made to close the gap). CNS also depends greatly on the allocated operating resources, and at present, if all the investment and hiring programs are fulfilled, the operating budget is far from the announced 40 MF.

Among the circuits that have been designed or are being designed in Grenoble, there is a digital COFIDEC which will be initially be built by Efcis out of NMOS devices; a memory coding circuit, also NMOS, and also made by Efcis (these two circuits use MD-MOS technology); an 8-bit CMOS microcomputer for the T83 which will be built by MHS in mid-1982; and an XMOS MODEM signal treatment device which should be built by Eurotechnique in 1983. CNS is also working on an 8 Mbit/s communicator for mixed speech and data information, in collaboration with Renault. This circuit will be built in the pilot shop with 3.5 micron HMOS technology.

CNS has also perfected an integrated CAO system with MD-MOS input language, the CASSIOPEE, whose elementary version is operational.

11,023
CSO: 3102/52

FOUR-LAYER 'MULTICARD' CIRCUIT DEVELOPED BY ICL

Paris ELECTRONIQUE ACTUALITES in French 6 Nov 81 p 13

For the development of rapid logic, ICL Logic-Layer, a subsidiary of the English company ICL, has perfected a four-layer printed circuit board called the Multiboard; the fabrication of an electric circuit on the outer layers of this board requires only a scalpel to remove the conductors that are not used, and soldered wires to make intermediate connections. This board has a quasi constant conductor impedance of about 50 ohms, making it operable at frequencies higher than 50 MHz, which are not at all possible with circuits that use wrapped connections, for instance. Moreover, ICL estimates that manufacturing lead times would then only be less than two weeks.

XY Conductors

The dimensions of the Multiboard are those of the European double card: 233 x 160 mm.

The board has four layers, the two inner ones being used for two supply channels and for the bulk of the assembly. The two outer ones are laid out in X and Y directions, and the circuit is provided with holes every 2.54 mm. According to company spokesmen, it is possible to mount up to 40 integrated circuits, or 650 integrated circuit pins, on the board.

Some of the holes are metallized at specific locations to provide connections between the supply layers and the inner bulk.

Bridging of the conductors by the user changes the characteristic impedance by only 0.5 ohms.

The X-Y structure could make it possible to develop circuits with busses on the first layer and with connections to these busses on the second outer layer. The application of this type of interconnection requires a layout which shows the connections to be made to components, as well as trims and cuts. Currently made by hand, these operations could eventually be performed by automatic machinery.

This product, which is not yet sold in France, would cost about $315 each. European sales should begin in a few months, not through company branches (ICL France, for instance) but through special sales teams.

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CSO: 3102/52

TWO-MW NASUDDEN WIND TURBINE TO OPERATE BY MARCH 1982

Stockholm NY TEKNIK in Swedish 15 Oct 81 pp 20-21

[Article by Mikael Holmstrom]

[Text] In 6 months--in March 1982--one of the world's largest wind power plants will be constructed at Nasudden on Gotland.

The wind power plant was ordered by state wind researchers and it will be delivered to the State Power Board by Kamewa in Kristinehamn.

Housed in a modest building near Kamewa's workshops is the project leadership of the Nasudden wind power plant. Here engineers have had to deal with a number of unfamiliar problems. After all, what is being produced on the workshop floor is a prototype. It is also Kamewa's first attempt to break into new markets.

Not much of the work in Kristinehamn has been made public since Kamewa received the bid for the wind power plant after tough competition.

At that time, 1978, Kamewa defeated its competitor Swedewind (Saab-Scania and Stal-Laval) for the right to produce the second of two prototype power plants.

The first wind power plant that the Energy Production Research Board purchased at that time will be erected in December in Maglarp, Scania. (That power plant was presented in NY TEKNIK, 1980:44).

Now, in 1981, the Nasudden power plant's 70 m tower has been completed on Gotland. The heavy components that must be mounted on the tower are under construction in the workshops.

The Nasudden plant will be the third largest wind power plant in the world (based on turbine diameter, 75 m). It is being built by a company with no previous experience in the field:

"The amount of new technology in this project is considerable. The most

difficult part of the design work has been that there are no models, no ready solutions," project leader and civil engineer Ove Hermansson said.

"Our method of solving these problems has been to use known technology for materials and systems. We have been deliberately conservative in our approach."

"Either this power plant will be the end of our involvement or perhaps it will have undreamt-of consequences. The market could become so large that we could produce a dozen or so power plants annually in Sweden alone," Ove Hermansson continued.

More Wind Power Plants

Kamewa, along with Svenska Varv, the manufacturer of the other prototype, is doing its best to see that the industry minister, the State Power Board, and Sydkraft become interested in more wind power plants. Of course, this is assuming that the prototypes function properly.

What problems might arise when the power plant begins test operations in June 1982?

"It is always difficult to make a prototype operate. What we might fear is a problem with the control system," Ove Hermansson answered.

When the first preliminary studies were made in 1975, the company believed it could manage the construction alone, including the aerodynamics and the turbine design and construction. This was not the case, however.

The project leaders in Kristinehamn--around 10 people--have their counterpart in Bremen, West Germany. Approximately the same number of people are working on the aerodynamics at Erno, a subsidiary of the gigantic VFW aviation company.

How "Swedish" is Kamewa's power plant?

"We are responsible for the system. We are also responsible for designing and producing the control system. We are doing most of the engineering work."

"If our project is compared with Svenska Varv's cooperation with Hamilton Standard in the United States, I believe we have a better grip. We are totally dominant--the Germans do as we tell them," Ove Hermansson said.

Erno in Germany previously had a wind power program of its own. Kamewa seems to believe that present expertise in West Germany should also be utilized if more power plants are built.

The first turbine blade is now finished in West Germany. It is now undergoing rotation tests. The steel structure of the second blade is now being welded and the blades, encased in plastic, will be transported to Gotland in March 1982. The same timetable holds for the remaining parts.

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CSO: 3102/72

BRIEFS

SEVEN PROJECTS FOR COMES--The Solar Energy Commission (COMES) has decided to support seven demonstration projects of particular interest. They are: (a) The installation at Porquerolles, of a gas generator which will use the island's forest resources and supply electricity and heat to the Porquerolles Botanical Conservatory. The wood, as well as straw, reeds, and household wastes, will be actually burned on the spot, recovered, dried, and formed into platelets; these will be burned in a gas generator with a thermal power of 400 kw. The gases will be washed and filtered, and a gas/air-powered motor-generator set will produce electricity, while heat will be recovered from the engine cooling circuit. This type of installation satisfies very well the aim of the botanical conservatory, which is to build a number of experimental and promotional systems as examples for the management of the Mediterranean natural environment. COMES will provide 37.5 percent of the financing for this project. (b) The completion of six French photovoltaic projects, jointly financed by COMES and EEC. The objectives of these pilot projects are the research and development of photovoltaic power plant systems in the range of 30 to 300 peak-KW, as well as small scale experiments on new systems. Among these six projects are: the placement of two 5 KW plants at the site of the Eurelios plant in Adrano (Sicily); a 50 KW plant at the location of the Nice Cote d'Azur international airport (to supply electric power to the airport's auxilliary equipment); a 50 KW plant at the Aghia Roumeli site in Crete; a 50 KW plant at Montbouquet (Herault); and a 44 KW plant at the Rondolinu site at Cargese (Haute-Corse). The last four installations are based on single-crystal silicon technology. [Text] [Paris SEMAINE DE L'ENERGIE in French 12 Oct 81 p 11] 11,023

SOLAR PONDS IN PORTUGAL--Lisbon--On September 27 CORREIO DA MANHA announced that in April 1982, Portugal will have the first European "solar lake," whose energy will be used to heat greenhouses belonging to the Ministry of Agriculture in Porto Alto (at 30 km from Lisbon). Using the salinity difference in the waters of an artificial lake, the water in the solar lake, whose construction will begin in mid-October, will have a minimum temperature of 35 degrees C in February, and a maximum temperature of 85 degrees C in August. With an area of 1200 square meters and a depth of 3.5 meters, the lake will be filled with salt-saturated water at the bottom and sweet water at the top. According to the two authors of the project, Karl Nielsen and Ari Rabl, technologists from American universities, who are quoted by the newspaper, the salinity difference will permit a heat accumulation. The paper also indicates that while this technique has already been used in the United States and Israel, it is unprecedented in Europe as far as commercial utilization is concerned, although it is being used experimentally in France. [Text] [Paris AFP SCIENCES in French 1 Oct 81 p 29] 11,023

WIND, PHOTOVOLTAIC POWER COMBINED--Paris--Coupling between an Aerowatt wind generator and a Sophocle photovoltaic heliostat with concentrator, was achieved by Aerospatiale as general contractor, on 25 September at the Turbie site of the CNET (National Center for Telecommunications Studies). This is the first instance of a successful joint utilization of local wind resources, and of photovoltaic energy with sun tracking. The complementary nature of these two forms of energy is particularly interesting in the islands of the Aegean or in the Antilles. In achieving this combination for the first time, in cooperation with CNET and Soterem, Aerospatiale has shown its interest in applying the technologic knowledge it has developed in its Helicopter and Balistics divisions, to the field of renewable energy resources. [Text] [Paris AFP SCIENCES in French 1 Oct 81 p 30] 11,023

CSO: 3102/53

SWEDISH RESEARCHERS STUDY MANUFACTURE OF MATERIALS IN SPACE

Stockholm NY TEKNIK in Swedish 22 Oct 81 pp 8, 10, 12-13

[Articles by Jan Melin and Reidar Carlsson]

[Excerpts] On the night of 1 October the Swedish Pirat research rocket was launched from the Esrange rocket base outside Kiruna. During the flight, metal foam was produced in a completely new manner. Another experiment conducted during the period of weightlessness will provide cheaper semiconducting materials in the future.

Metal foam is a new substance that may be of great significance as a construction material. It consists of metal that contains many small gas bubbles.

Swedish researchers have now conducted successful experiments on producing metal foam in space. These experiments may provide information on how the foam could be manufactured on earth.

Metal foam was produced in the rocket in one of the experiments. Samples of various aluminum alloys were melted while the rocket was in a weightless state. During the melting process the samples were "fluffed up" to a foam-like material.

The samples consist of aluminum and aluminum alloyed with iron and titanium. They are produced at the Institute of Metal Casting at the Technical University of Stockholm by Prof Hasse Fredriksson and research assistant Hamid Shahani.

The samples, with a volume of 2 cm^3 each, were melted in a crucible saturated with hydrogen gas under high pressure. When the samples have been melted, the hydrogen gas is dissolved in the molten metal. When the samples have solidified, also under pressure, they contain compressed hydrogen gas dissolved in the metal.

When such a hydrogen-saturated sample is then melted under normal atmospheric or lower pressure, the hydrogen is released and the metal is fluffed up. Because of the earth's force of gravity, however, the sample collapses and

the result is not metal foam, but a more slag-like product.

When the samples were melted under weightless conditions in the Pirat rocket, however, they retained their foam-like state even after solidification.

Pore Formation in Metal

Hasse Fredriksson said:

"These experiments are on the basic research level. It is difficult to say how metal foam could be utilized before we have analyzed its strength and other characteristics. One possible use is as a shock absorbing material of high quality."

"Most importantly, however, we can now study pore formation in metal. We know practically nothing about that, since experiments cannot be conducted on earth under the influence of gravity. Once we have discovered how pore formation occurs, we may be able to develop techniques for producing metal foam on earth as well."

The materials research unit used in the experiments consists of a cylinder that is 37 cm high with a diameter of 43 cm. It was constructed by Rolf Jonsson and Sven Wallin of the Rymdbolaget.

The unit contains 12 cylinders of three different types. These have various furnaces used in the materials research experiments. Four of the cylinders containing three furnaces each are used in the metal foam experiments. Thus, a total of 12 metal foam experiments may be conducted during one rocket flight. A power supply battery pack is located at the base of the unit.

Weightless Condition

The entire unit is divided into two equal parts with separate electrical systems. This is so that half the experiments will be successful even if a short should occur in one part. The unit also contains various measurement and control systems. These are contained on plug-in printed circuit cards. In this way, different circuit cards may be plugged in for other experiments.

The entire flight of the rocket took 15 minutes. The rocket was virtually in a weightless condition for 6 minutes. When weightlessness was achieved, the experiment started automatically.

Each sample contained a filament from an ordinary photographic lamp of 400 W each. In about 15 seconds the samples were melted and the metal foam formed. The entire cylinder was first evacuated and then filled with argon gas so that the filament from the photographic lamp would not oxidize and burn up. During the experiment the temperature was measured by a thermocouple in the sample and another indicator registered the pressure. These

values were registered on earth and they will now be evaluated.

"Even now, however, we can say that the experiment went well," Prof Hasse Fredriksson said.

Three Times More Usable Semiconductors

Today up to 75 percent of the semiconductor crystals manufactured must be discarded. This is because of our poor knowledge of how metals and other substances blend together.

Swedish researchers now believe that 75 percent of the crystals could be utilized, instead. This was concluded after successful materials research experiments onboard the Pirat rocket.

Tore Persson and engineer Lars Lindstrom of the Chalmers Institute in Goteborg have constructed a measuring device for determining diffusion coefficients in molten metals.

"These coefficients are practically impossible to determine correctly on earth due to the force of gravity," Tore Persson said.

"With my experiment, I hope to measure what effect gravity actually has. Once this effect is known, it may be taken into account and, in this way, measuring equipment may be calibrated for experiments on earth."

"After studying the literature, I have concluded that the diffusion coefficient is determined falsely for many materials."

"For example, I have investigated the diffusion coefficient for gold in liquid sodium. Simply by tilting the test equipment, I found a diffusion coefficient that was 120 times greater than the figure provided by other measurements."

The great discrepancies in the measured values result from the fact that the effect of gravity on the measurements is unknown. The diffusion coefficient indicates how two substances blend together or diffuse in each other. In the production of semiconducting crystals, for example, gallium diffuses in germanium.

Since the exact value of this diffusion coefficient is unknown, we do not know how a substance that has blended with another substance will solidify. It is unknown which solidification rate is best or which temperature yields the best results.

Because of this, 50 to 75 percent of all semiconducting crystals manufactured must be discarded, since there is an uneven distribution of the impurity.

"I am convinced that in the future a maximum of 10 percent will be discarded, when the diffusion coefficients and solidification process are known," Tore Persson said.

Facts on Research in Space

One branch of research that in recent years has begun using space for its experiments is materials science. Swedish materials researchers have also begun to utilize weightlessness in space for experiments that are impossible on earth.

In space experiments it is possible to avoid the problems that often arise when a molten material is allowed to solidify on earth. On earth the force of gravity causes streams of material in the sample, so-called convection. Convection occurs primarily because various substances in a melt have different densities.

When the disturbing effects of convection are reduced more knowledge will be gained of production processes for various materials and, therefore, about the material itself.

Swedish research has traditionally enjoyed a strong international position in the field of materials science. In order not to lose ground in the future, Swedish researchers have now begun materials research in space. The Swedish Pirat rocket, which was launched from Esrange near Kiruna, is an example of that and space has already been booked for Swedish materials research experiments on one of the first American space shuttles.

The areas of materials science the Swedish researchers are interested in primarily are eutectic structures, dendritic growth, miscibility gaps, and diffusion in molten metals.

When melts of pure metals are mixed an alloy is formed. For many mixtures a certain proportion of the metals has a lower melting point than all other proportions of the metals included in the alloy. If the melt is alloyed to solidify from this temperature, the alloy assumes a special geometric structure. This is called the eutectic structure. On earth, convection creates disturbances in this structure, however. These faults reduce the resistance of the metals to stresses across the laminae.

Dendritic Growth

When certain alloys solidify, solid metal crystals are formed through so-called dendritic growth. The dendrites are solidified, tree-like outgrowths in the molten metal. The word "dendrite" comes from the Greek, meaning tree. Materials researchers assume on theoretical grounds that these outgrowths have different forms if the metal solidifies under weightless conditions or on the earth. Convection also causes outgrowths to break,

which reduces the strength and workability of the alloy.

Miscibility Gaps

Not all metals can be mixed with one another if the temperature is below a certain limit. Below this temperature, convection will occur on the earth's surface and the metals will separate into layers. This layer formation cannot occur under weightless conditions. If a melt that has solidified under weightless conditions retains its miscibility, then a completely new material has been produced. Such materials may possess useful characteristics such as increased strength.

Researchers need to know various types of transport properties in metals used in an experiment. Examples of such properties are the rate of diffusion and the thermal conductivity. Researchers must know how these properties appear in the weightless state in order to evaluate other experiments conducted in space. The measurements must be made under the same conditions as those used in the experiments, i. e. under weightless conditions.

Another advantage of conducting experiments under weightless conditions is that the experiment can be conducted without having the experimental material in contact with any container or anything else that could contaminate the sample. Thus, researchers believe that crystals could be produced that are much purer than those previously produced.

Thus, fields of application for products produced under weightless conditions can already be discerned. Production under weightless conditions is not necessary, however, for materials research in space to be important. Researchers believe that experiments under weightless conditions will provide valuable information for materials production on earth.

9336
CSO: 3102/74

FRANCE, FRG COOPERATE ON HIGH-SPEED GROUND TRANSPORTATION

Paris ELECTRONIQUE ACTUALITES in French 6 Nov 81 pp 1,8

[Article by J.-P. Feste]

[Text] Grenoble--On 29 October, test installations were inaugurated for a linear railway traction motor of the Institute for Transportation Research, in the presence of a representative of the Ministry of Transportation, and of a delegation from the FRG Ministry for Research and Technology (BMFT).

It is in fact as part of a French-German cooperation, that tests will be started in 1982, on linear traction motors for a prototype engine capable of reaching 100 km/h.

These tests themselves are part of studies for a contactless means of transportation capable of functioning at 300 to 400 km/h in some 15 years.

The cooperation agreement between France and Germany on the year's means of transportation, signed in 1978, is thus now entering a concrete test phase for a linear motor (invented by the Saint-Etienne engineer Guimbal). These tests should allow subsequent realistic technical-economic comparisons between several high-speed transportation systems.

The "propulsion-guidance module" for the motor of a magnetic suspension vehicle developed by the German company Thyssen-Henschel will be certified during 1982. It consists of an U-shaped linear induction motor and of its control oscillator (studied by CEM), developed by the Saint-Etienne company Celduc with support from ANVAR; as well as of an electromagnetic guidance system, developed by Thyssen-Henschel with the support of BMFT.

Difficulty: Electronic Control

The construction of such an on-board propulsion-guidance module is encountering difficulties in the perfection of the control electronics of the actual motor and of the suspension device. Prototypes of the electronics of the latter device have however been built. They consist of a transistor chopper working at 100 kHz. This chopper switches 440 volts at 40 amperes by means of four BUX 98 transistors in constant operation. It is protected against output short circuits. The fact that its efficiency is greater than 99 percent is explained by the use of lossless ancillary switching circuits, whereas the traditional circuits use resistors and capacitors which consume power. This chopper has been built by Thyssen-Henschel.

The oscillator for control of the linear motor is being studied by the CEM company, and will be built by Fintronic. This oscillator, whose frequency will have to be variable, will use power thyristors, because transistors for the voltages and currents required by the linear motor are not usable. A power of 3 MW must be developed to propel a vehicle at nearly 300 km/h.

The choice of a linear motor is not yet final. Research is being carried out in two directions: in Germany, the option is a long-stator motor; in this case, the track is a coil and the vehicle carries only a passive "rotor," avoiding electric transmission from the track to the vehicle.

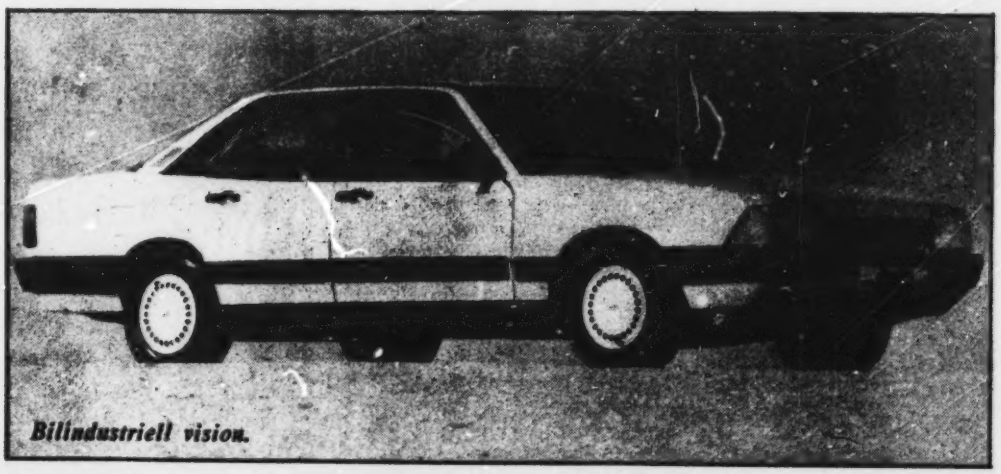
On the French side, the studies are focused on a one-piece short stator in the vehicle, and a U-shaped rail. It would appear that the solution being pursued would have the German electromagnetic suspension system, and the French U-shaped propulsion system.

11,023
CSO:3102/54

AUDI'S VISION OF CAR OF FUTURE PRESENTED

Stockholm NY TEKNIK in Swedish 8 Oct 81 p 14

[Text] Audi has now presented its vision of the car of the future. The car is similar to the Audi 100, but the air resistance has been reduced to c_w = 0.288! Unlike many other test cars in the West German Auto 2000 project, Audi has chosen to retain the gasoline engine. The cylinder volume is only 1.6 liters. The turbocharger and the knock detector contribute to the high power--110 hp (81 kW). Both a turbocharger and a knock detector are found on this year's models of the Saab Turbo.



Auto industry's vision

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CSO: 3102/72

BRITISH MAGNETIC LEVITATION LINE OPEN TO PUBLIC BY 1984

Bern TECHNISCHE RUNDSCHAU in German 20 Oct 81 p 53

[Text] The experimental vehicle in Figure 3 hovers on a magnetic field, guided by a single concrete rail. It is the prototype of a commuter vehicle which will link the new airport terminal in Birmingham with the railroad station and the National Exhibition Centre by 1984. The carriage hovers 15 mm above the guiderail. This distance does not change, even if the load increases or shifts. Control mechanisms respond to changes of this kind and adjust the energy supply to effect the necessary compensation. The magnetic levitation system known as "Maglev" provides smooth, noiseless travel without exhaust gases. The linear induction motor underneath the vehicle creates a magnetic field between it and the guiderail, raising the vehicle and propelling it. The prototype vehicle is currently being tested by research and development engineers of British Rail to determine how it reacts in sharp curves and on gradients.

The commuter transportation planned for Birmingham will consist of three vehicles, each of which has room for 30 seated and 48 standing passengers. The cars have no driver, and the service will require only two or three men to run. Cable television supervision will ensure safety of operation. Passengers will be able to summon the cars by pressing a button at the stations. The trip will take 90 seconds from end to end, at a speed of 36 kms/hour.

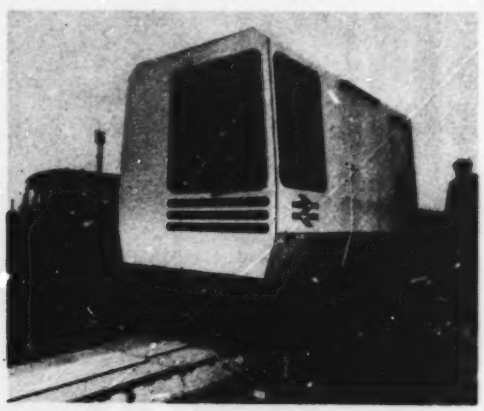


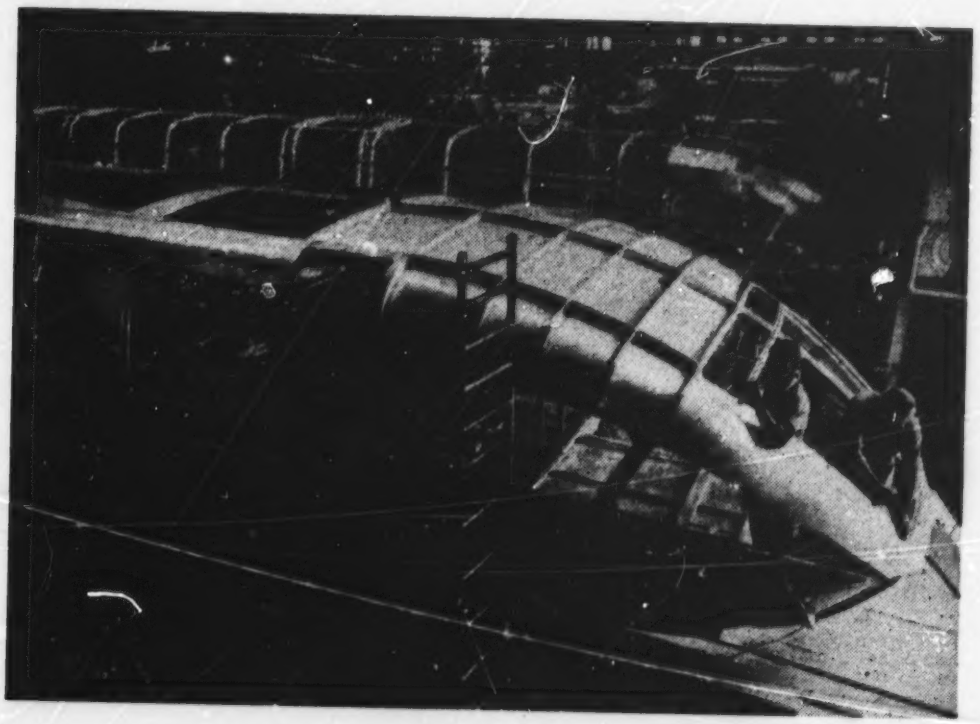
Fig. 3. Experimental vehicle for the magnetic levitation railroad in Birmingham.

9581
CSO: 3102/65

WORK CONTINUES ON MAGNETIC LEVITATION VEHICLE

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 11 Nov 81 p 5

[Text]



Intensive work is continuing on the magnetic levitation railroad: While the test track in Emsland is under construction, Krauss-Maffei, one of the companies in the MBB [Messerschmitt-Bolkow-Bloehm] consortium, is building the double-section magnetic levitation vehicle 06. MBB reports that the vehicle is of sandwich construction in which prefabricated sandwich plates are bonded and riveted into a "skeleton" of double-T sections. The magnetic propulsion and guidance system--the "heart" of a magnetic railroad--was developed at MBB in Ottobrunn. In a magnetic railroad the levitation truck assumes the function of a swivelling truck. MBB says that the eight levitation trucks will be thoroughly tested before they are attached to the body.

9581
CSO: 3102/51

FIRST FLIGHT OF 'SKYSHIP 500' DIRIGIBLE SUCCESSFUL

Paris AFP SCIENCES in French 1 Oct 81 p 47

[Text] London--The new dirigible Skyship-500, with which the British company Airship Industries hopes to reinstate this means of transportation, has successfully performed its maiden flight on 28 September, leaving from the Cardington air base in the center of England.

It is a non-rigid airship, whose helium-filled shell was manufactured by the French company Aerazur, a subsidiary of the Zodiac group. Powered by two Porsche car engines, each connected to a propeller which will give it a cruising speed of 62 knots (nearly 115 km/h), it is designed for a payload of two tons, which means about ten passengers in addition to the crew.

A spokesman for Airship Industries has indicated that during this two-hour maiden flight, the craft reached an altitude of some 420 meters, and a speed of 44 knots.

Airship Industries hopes to obtain a navigability certificate for passenger transportation within one year, and by the end of this year for commercial flights without passengers. Equipped with a pressurized cabin, it could be used for sea surveillance, and for the electronic surveillance of borders, territories, fisheries, and so on.

The builders are already preparing several larger versions, one of which, capable of lifting 10 tons, will enable them to respond to an offer for bids issued by the United States Cost Guard, who wants to obtain airships for maritime patrols. Another version, the Skyship-600, whose maiden flight is planned for mid-1982, could lift nearly three tons, or some twenty passengers.

The construction of the Skyship-500 has cost 1.5 million pounds.

11,023
CSO: 3102/54

BMW INSTITUTES NEW CONCEPT TO OPTIMIZE PRODUCTION METHODS

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 16 Nov 81 p 7

[Article by Joh-Chr Spira: "BMW Plans To Optimize Manufacturing Technology in a Pilot Plant"]

[Text] Frankfurt, 15 Nov--Of course the famous Monday car does not exist in reality. But in order that no manufacturing problems occur during the difficult phase at the start of production of new car models, nothing can be left to chance. The preparations for the start of production have to be particularly perfect with those makes of car whose product philosophy is a claim to high quality. Dr Wolfgang Reitzle, head of the pilot plant and methods technology at BMW, had made a long and thorough study of the periphery of cause and effect during production start-up of earlier BMW models. He suggested a solution: "We need a pilot plant, a mini-automobile factory, in which we can build the first prototypes months before the start of production, in which we can be become familiar with the new cars as early as possible and recognize the fundamental manufacturing problems."

Reitzle understands an automobile product philosophy claiming a "high level of quality" to mean above-average quality in construction and manufacture. Besides a product designed for ease of manufacture, he includes in construction quality the dimensions and choice of materials to meet high sustained loads, as well as advanced technical solutions in chassis and engine design to provide comfort and above-average performance, while retaining controllability in critical driving situations. Controllable manufacturing quality in the factory finally extends to the quality of the bought-in parts and depends on precise quantities and suitable quality control checks at the time of delivery.

Other automobile manufacturers have pilot plants. But BMW has quite consciously developed a new concept. At BMW they are convinced that it is not only effective in advancing the deadline for start of production considerably, but it can also reach the quality level required for production in the shortest time. The pilot plant was dedicated with the new 5-series. The result has clearly surpassed all expectations. Reitzle says: "It was not only the best start of production in the history of BMW, but practically a few months after the start of production,

according to internal quality systems (audit-check), we attained and sustained the quality number that we had after several years during the best times of the 5-series, although we were not at full production volume. This made it possible to reach full production much sooner than planned."

The workers in the pilot plant familiarize themselves with the new car much sooner than usual, in fact, 2 years before the start of production. They build prototypes and try to discover all the basic manufacturing problems. One year before the start of production, when the car came to the pilot plant in its actual form, it had already reached a much higher state of technical readiness for manufacture, that is, it was more ready for the production line and easier to assemble. Four AV (work preparation) vehicles were built in this way. At this stage it was possible to identify about one-half of all the manufacturing problems which had to be solved later on the line. As a result, most of them could be taken into account when tools and means of production were being considered. To prepare the plant, workers in the pilot plant were trained on the line in the manufacture of the previous model. They became familiar with manufacturing problems and, from the start, were able to ensure that certain problems did not occur only when the new model came out. Conversely, 2 years earlier, the most important manufacturing people from production, experienced master craftsmen and workers, came to the pilot plant to introduce manufacturing knowhow in pilot production.

The methods technology office adjoins the pilot plant, with its own workshop which can carry the necessary changes on any part at short notice. Consequently, an extremely flexible group of workers is needed who can work more or less on call and not have to wait for a drawing. Twelve months before the start of production--formerly 0-series, now functional assembly--60 percent of all the parts must be available and be able to be assembled using tools. So the parts that are now put together are no longer hand-made but come from finished machinery. They amount to several hundred parts selected to check accuracy of fit and corresponding to later production status. The pilot plant workers can maintain a constant review of the exact state of development of the parts, with the assistance of a small data processing unit.

The establishment of the new pilot plant means more than just preparation for the start of production. In contrast to comparable installations, there is the group of specialists in "methods development," besides the group working with the unfinished body and manufacturing assembly. New manufacturing methods are prepared that will be definitive for all BMW factories. This group of specialists tests, for example, all the available robots and the appropriate technology for their use. Other experts are developing new methods of surface technology, such as powdered paint technology, which will soon become a new area of specialization.

In a very early phase of a project, the development office is given expert advice by production planning. If a new model is being assembled, the corrosion protection specialists and the welding and bonding specialists are on hand and render their opinion of what development has thought up. There may be a suggestion as to how robot welding can be employed and optimized. Or it may turn out that a small change in construction can eliminate a critical source of corrosion in a flange.

By confronting experts who have this type of knowledge and experience with the new car, their fertile ideas can be used before the new model goes into production. BMW considers this paralleling of methods development and pilot plant to be an important new area of specialization. With a small team, the greatest possible effect for safety in volume production is achieved.

9581
CSO: 3102/65

NETHERLANDS, BELGIUM, FRANCE BUILD POLYESTER MINESWEEPERS

Amsterdam ELSEVIER MAGAZINE in Dutch 14 Nov 81 pp 134, 135, 137, 138

[Article by H. J. Looman: The construction of a series of polyester minesweepers by Van der Giessen-De Noord (GN) Shipbuilding in Alblasserdam makes good progress. Starting problems have delayed work, but these are now conquered. The trial run of the first of 15 minesweepers made of fiber and artificial resin is now in sight. Shipyard director J. C. C. Smit speaks of a unique project in many ways, which one can also call a textbook example of industrial innovation]

[Text] This is a unique project, because of the production process in the factory and because of the cooperation of two other countries: France and Belgium. In total it concerns the building of 40 minesweepers, 15 for the Dutch, 15 for the French and 10 for the Belgian Navy. The latter initially planned on ordering 15, but that number was later reduced to 10 with an option on the remaining 5.

Everything hinges on the fact that the navies of the three countries had as an unconditional requirement that the new series of minesweepers--contary to the usual wooden construction--would have to be constructed of fiber reinforced polyester (frp).

To Van der Giessen-De Noord (GN) this building of a series of 15 minesweepers has been a technical challenge of the first order from the beginning. "This is one of the most difficult tasks we have encountered since our yard started in 1962," says Mr J. C. C. Smit. "Polyester is of course a totally different building material from steel or wood. Not only from a technical point of view, but also in a social and organizational point of view. The building materials and the finished product are made in one process, which in shipbuilding is something very particular."

This required a completely new and unconventional approach. A big working hall had to be constructed, 144 m long, 43 m wide and 23 m high. This was necessary because fiber reinforced polyester can only be worked in a steady humidity and a steady temperature. This guarantees a final product that meets the very high quality requirements which are required by the commissioner.

Mr Smit: "We realized immediately that it concerned a production process that would give us a few problems, particularly in the beginning. And those problems presented themselves. You could call them kinks. Through the use of equipment

improvements and refining of the production method we have had that matter firmly in hand since the fall of 1979. At the moment we are working on four ships at the same time in the production hall and the first ship, the 'Alkmaar' is far enough in final building that she can be launched in the first half of next year. Yes, it is more than a year later than we had hoped, but it took time before we had the proper production rhythm. Additionally, during the building of the prototype on the French navy yard in Lorient we had to solve more problems than were expected. That ship will make its trial run this coming December, but this could have occurred at the end of 1979.

The steel mold in which the ship's hull is raised, and which consists of fiberglass and artificial resin layer after layer, was manufactured in our own shipyard. Steel of high quality had to be used, as the mold had to be stiff and inductile. Moreover, the inside had to be polished as smooth as silk. "That was quite a tough job," says yard director Smit, but the mold was finished in 1978 and the keel for the first minesweeper could be layed down.

The production is established such that work can be done on four ships at the same time. The production process in this curious shipping factory consists namely of four phases: (1) the building of the hull in the mold; (2) the placement of the decks and bulkheads; (3) the installment of the main propulsion; (4) the finishing of the ship. Each 5 months the ships move up one position, such that new space becomes available for the next ship each time. This requires an industrial organization which is adjusted very accurately, but this also functions according to smooth management.

In this tremendous pilot hundreds of men and 30 women are working on the polyester hulk, all of the personnel educated in our own company, since the hiring of people who had experience in polyester, was not possible. During the hardening process of polyester small parts of sturene are freed, which need to be kept within the bounds. The labor inspection requires that it cannot be more than 100 particles per million. Smit: "We stay far below that. I may say that our Company has not saved money nor effort in order to reduce to a minimum difficult working conditions such as bad climatological conditions, noise and air pollution. Due to the air treatment installation we are capable of reducing the number of released styrene parts during full production to 25 p.p.m. This is possible through the well thought-out exhaust and ventilation system, which cost us 10 percent of the total investment, which, by the way, we did not mind spending. Throughout the year a constant temperature of 18 degrees Celcius is maintained in the production hall and a constant humidity of 55 percent. Those are working conditions no one can complain about."

Since these plastic ships are not built on a slipway, a different manner of launching became necessary. An "elevator" was chosen, which can lift ships in and out of water up to a weight of 1250 tons. This ship elevator, the first of its kind and designed by the Dutch concern Hydraudyne in Boxtel, is ready for production and was recently put into use amidst festivities.

The cooperative obligation between the French, Belgian, and Dutch navies leans on an equal economic capital brought in by the participating countries. In short, the Dutch industry supplies--for all 40 minesweepers which are under

construction--the main propulsion, the gear wheels, screws and screw shafts. This is a particularly attractive order for Brons-Appingedam, the concern that supplies the special Stork-Werkspoor diesel motors. Rademaker constructs the gear wheels and Lips the screws and screw shafts. Altogether this entire project means employment for more than 7000 Dutch man years, the suppliers included. Each of the three countries build their own polyester hulls. The French industry takes care of the minesweeping and combatting system while the Belgians, who have not yet started building the polyester hulls, take care of the mechanical and technical installation.

These minesweepers--the Royal Navy speaks rather of mine combatting ships--which must perform dangerous work at sea later on, have to meet special requirements: (1) a very low underwater noise; (2) a minimal disruption of the earth magnetic field in the immediate surroundings of the ship; (3) perfect maneuvering possibilities and (4) large shock resistance of all installations in order to be able to resist mine explosions from some distance from the ship.

The big difference between a conventional mine'sweeper' and this advanced mine 'fighter' is that the former more or less does its work blindfolded and whereas the 'fighting' occurs with wide open eyes. During the sweeping a mine which has to be removed by the sweeper hanging at the back of the ship has to be approached magnetically and accoustically. Yet, one has to wait for something to be caught. During the hunt, the mine will be actively searched and localized by the sonar which dispatches sound waves. After that a small, unmanned submarine which propels itself is put overboard. This mini-sub, provided with a television camera, sends pictures to the ship via cable. After identification the mine can be destroyed by means of an explosive. This smart mini-sub is described with the letter-cipher-combination PAP 104. Through active searching of the prey the mini-hunter is in sea territories which lend itself to this, a much more effective tool than a minesweeper.

From this should not be concluded that the Royal Navy does not have hunters at its disposal at this moment. At the time four minesweepers of the Dokkum-class have been rebuilt to hunters at Van der Giessen-De Noord. The experience gained from this certainly contributed to the fact that this shipyard was well prepared for the execution of the present naval order. This order will provide employment for 250 men and women until 1987, when the last and 15th minesweeper will be delivered. And hopefully much longer.

Three-quarters of the minecombatting ships, presently in service in the Western world, are antiquated and therefore, ready for replacement. GN Shipbuilding is, thus, by its nature into the market: "I may say that this shipyard can count itself at this moment among the most modern and best equipped in the world. We aim for a special, high-quality product and those who like to use words such as industrial innovation, can come and look at us. The building of this series of frp ships is a classic example of innovation. We have been busy for years with this, and started thinking about it in the beginning of the 1970's.

"As far as the sale of these minesweepers to foreign navies is concerned, I can only say that several countries have shown their interest. This, however, is not a business of our yard alone. In a sale to third parties the three partners will

act as a unity as well. This does not take away the fact that it would become a good business for us and the supplying industry if orders would increase in the course of the coming years."

Caption on pp 134

Two polyester minesweepers in the third and fourth building phase in the big working hall of the Van der Giessen-De Noord shipyard in Alblasserdam. The polyester, reinforced with fiberglass is so transparent that one can see a workman's footprints, while standing under the ship. A curious experience.

Caption on pp 135

Polyester minesweepers of the Alkmaar-class are rather small ships: 47 m long and 9 m wide, with a draught of only 2,45 m and an average water displacement of 511 tons.

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CSO: 3102/63

END

JPRS 79836

11 January 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 87

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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JPRS 79836

11 January 1982

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SCIENCE AND TECHNOLOGY

No. 87

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ELECTRONICS

THOMSON-CSF DEVELOPS FASTEST AMBIENT-TEMPERATURE CIRCUIT

Paris ELECTRONIQUE ACTUALITES in French 20, 27 Nov 81

[Articles by J. P. Della Mussia and F. Grosvalet]

[20 Nov 81 pp 1, 13]

[Text] The Central Research Laboratory (LCR) of Thomson-CSF has just built the fastest known semiconductor integrated circuit to operate at ambient temperature: only 22 picoseconds of logic gate propagation time in a circuit which integrates an 11-stage ring.

Up to now, the lowest switching times had been observed on Josephson junctions (on the order of 10 ps), but at a temperature close to absolute zero (with IBM being the world leader), and on an HEMT circuit (TEGFET in French), perfected by Fujitsu (17.1 ps per stage), operating at 77 degrees K.

The fact that the 22 ps have been achieved at 25 degrees C is a fundamental advantage; it could reorient all the research being conducted in laboratories which work on components for major computers, planned for after 1990. Moreover, LCR expects to further improve this performance.

The circuit in question uses a TEGFET structure. In particular, it takes advantage of electron confinement at the interface of GaAlAs junctions on GaAs, of molecular jet epitaxy, and of 0.6 micron electronic masking.

Details of LCR's work in this field will be given in our next issue.

[27 Nov 81 p 11]

[Text] The world's fastest ambient-temperature integrated circuit (22 ps logic gate propagation time in an 11-stage ring oscillator), presented last week by Thomson-CSF's LCR (see our issue of 20 November), is the fruit of several years of research in the field of GaAs-GaAlAs heterojunction transistors called TEGFET (two-dimensional electron gas MESFET).

Indeed, long before becoming interested in ultra-fast GaAs integrated circuits, LCR had conducted studies on the fabrication of discrete TEGFET devices; this has led to interesting results in the hyperfrequency domain, and to a good understanding of the physical phenomena involved in these structures. Last September, at the international conference on GaAs held in Tokyo, the laboratory presented the first normally-off, low noise, hyperfrequency TEGFET: 2.3 dB noise at 10GHz with an associated gain of 7.7 dB. This device, with an 0.8 micron line width, a drain-source gap of 4 micron, and a classic planar structure without V-groove, offers a performance comparable to that of the best conventional GaAs MESFET devices, which however, require more complex technologies (0.5 micron line widths with V-groove, 2.5 micron drain-source gap). Given these results, LCR has chosen normally-off TEGFETs as basic devices for ultra-fast or hyperfrequency logic integrated circuits. Activity on these circuits began at LCR early last September with the success that we have noted. Mobilities of 100,000 cm^2/Vs have even been obtained at liquid nitrogen temperature with 0.6 micron line widths (Fujitsu hopes to reach 60,000 cm^2/Vs with 1 micron).

In 1982, LCR will be carrying out its research in ICs as well as in the area of hyperfrequency discrete devices: in the first case the goal being to achieve at ambient temperature, speeds comparable to those of Josephson devices--which have to operate at temperatures close to absolute zero. If this objective is reached, the future of Josephson devices could well be strongly compromised; however, we must be careful not to give them up too soon, since they are still the best in terms of consumption. At the beginning, as is the case for all the laboratories in the world working on this problem, LCR will study TEGFETs at liquid nitrogen temperature, which according to Mr Linh, who is in charge of TEGFET research, will make it possible for the company to make more rapid progress.

In the hyperfrequency area, studies on the reproducibility of the devices presented in Tokyo, and the transition to 0.5 micron line widths, will be conducted in parallel, with the possible installation as soon as next year, of a pre-industrial development group such as the one that was created in 1976 for semiconductor lasers.

Molecular Jet Epitaxy, Basis of TEGFET

Unlike normally-off GaAs MESFETs, normally-off TEGFETs have a low input resistance, which allows low-noise operation. This property is associated with the existence of a shallow surface depletion zone, resulting from the actual structure of the TEGFET, where impurities and electrons are separated, with the latter being confined in a two-dimensional accumulation layer. The advantages of these new hyperfrequency transistors are not due solely to high mobility, but also to the intrinsic properties of the two-dimensional electron gas, which in particular, makes it possible to obtain a higher operating speed and therefore devices which operate at a higher frequency.

At the basis of TEGFETs we find molecular jet epitaxy, which because of its low growth rate (several angstroms per second) permits a good control of the thickness and doping of the various layers. LCR uses a RIBER installation which grows 10 layers per day on 2-inch substrates; it also participated in the development of this installation (there even exists a licensing agreement between the two companies for the improvement of molecular jet epitaxy installations).

The normally-off TEGFET presented in Tokyo was fabricated by depositing on a semi-insulating GaAs substrate a 1-micron p-type GaAs layer, followed by a 60 A undoped GaAlAs layer and a 700 A silicon-doped GaAlAs layer, the latter being reduced to 500 A by chemical etching (it is the thickness of this last layer that determines the normally-on or normally-off character of the transistor). For metallization, LCR has used a conventional planar structure in which the 0.8 micron-long Al grid is deposited directly on the last layer without any V-groove after deposition of drain and source contacts (gold-germanium eutectic on annealed nickel). The contact resistance measured on this type of device is less than 10^{-6} ohms cm .

11,023
CSO: 3102/66

CAMECA COMMERCIALIZES FIRST X-RAY MICROLITHOGRAPHY EQUIPMENT

Paris ELECTRONIQUE ACTUALITES in French 20 Nov 81 pp 1,11

[Article by F. Grosvalet]

[Text] Cameca, a subsidiary of Thomson-CSF specializing in scientific instruments, officially announced on 12 November at Productronica, the commercialization of the first X-ray microlithography equipment. This instrument, the XPWS 301, is a 1/1 projection wafer stepper, with proximity operation and capable of directly inscribing 0.2 micron lines with an accuracy of 500 A on silicon wafers up to 3 inches in diameter (under ideal operating conditions, the instrument can inscribe 0.1 micron lines with an accuracy of 200 A). By comparison, the most sophisticated ICs presently on the market use 2 micron lines. Cameca is now accepting orders with a 10-month delivery date for this equipment, intended at first for research and development laboratories (at a price of 7.5 million francs).

Since submicron geometries are not expected to be in production before 1990, there is no current market for this type of equipment in the industrial field. However, the market for X-ray wafer steppers is not negligible at present: as we were told by Mr Gourgout, sales director for the microlithography division, based on polls conducted in the United States, Europe, and Japan, the French company estimates the worldwide demand to be 50 machines between now and 1985 (MacIntosh expects it to be 10-20 during the same period). The XPWS 301 was officially announced at Semicon/East in Boston (United States) last September, and since then, Cameca has received some fifty requests about it from small and large American companies (Bell Labs in particular). The French company hopes to become a leader in the field of X-ray wafer steppers and thus find itself in a good position for crossing the threshold into production (not before 1990).

It appears to be well positioned right now, being in fact the only one to commercialize an X-ray wafer stepper. Other companies have developed such machines for their own use (Bell Labs and IBM for instance), or are working in this area (NTT has recently announced a prototype which can inscribe 0.5 micron lines on 3-inch wafers at the rate of five wafers per hour), but none of them has advanced as far in fabrication. Moreover, this type of equipment fits very well into Cameca's primary domain, which is that of laboratories, much better than the other two microlithography devices (FEPG electronic masker and ARW 620 optical wafer stepper) manufactured by the company and less advanced in their design).

Just like the others, the XPWS 301, which was developed and perfected at LCR (Central Research Laboratory), will at first be manufactured at Courbevoie; a specific production unit could be built later if the market develops as planned (the decision should be taken next year).

X-Rays of 13.3 Angstroms Wavelength

Given the research orientation of its equipment, LCR has sought to obtain the highest possible resolution instead of high production rates. It is notable however, that according to Mr Gourgout, the XPWS 301 can be readily automated for pre-production, although many upstream and downstream problems remain to be solved by IC manufacturers before submicron technologies are placed in production. It is significant for instance, that in order to test its wafer stepper, Thomson-CSF was limited by the resolution of masks achieveable on LCR's electronic masker (0.3 micron at best); the full capabilities of the XPSW 301 could consequently not be tested (0.3 micron designs were inscribed on a PMMA-type standard resin). On the other hand, etching has so far had difficulties in keeping up with the progress of microlithography.

The performance of the XPWS 301 is based in part on the use of 13.3 A long X-rays (4.4 A is the usual wavelength) which make it possible to work by proximity (the distance between the mask and the slice varies between 5 and 20 microns, with 10 microns being considered optimum). Moreover, gold's good absorption at this wavelength makes it possible to obtain adequate contrast with a gold film of only 0.1 micron on the mask (0.6 microns are necessary at 4.4 A), thus eliminating shadow effects (the masks are also easier to make by depositing a 0.5 micron silicon nitride layer on a silicon substrate). In addition, an original (a patent has been issued) laser optical alignment technique based on diffraction patterns and Fresnel zones enables an accuracy of 500 A and total automation at this level.

The X-ray wafer stepper can handle wafers up to 3 inches in diameter, and has an exposure field of 100 square millimeters. It operates as a conventional wafer stepper, without reduction but under vacuum, with a much longer exposure time of 10-15 min for a PMMA-type standard resin (necessary for 0.2 micron lines), and of 1 min for a FBM110-type rapid resin, which makes it possible to achieve 0.3 micron at best.

11,023
CSO: 3102/59

FIRST FRENCH-MADE C-MOS UNCOMMITTED LOGIC ARRAY

Paris ELECTRONIQUE ACTUALITES in French 20 Nov 81 p 13

[Article by J.-P. Della Mussia]

[Text] The Microelectronics Department of the Military Applications Directorate (DAM) of the AEC, at Bruyere-le-Chatel in the Paris region, is expecting to receive in the next few weeks, the first uncommitted prediffused wafers (prediffused arrays) carrying an integrated circuit with 770 pairs of non-interconnected C-MOS transistors. This prediffused circuit was designed by AEC itself, based on its experience with the personalization of Interdesign prediffused C-MOS circuits. The circuit is diffused by EFCIS with its metal-mask economical C-MOS technology. It will be interconnected by AEC to obtain the desired patterns but will also be offered next year in the catalog of the new design center for custom integrated circuits which EFCIS is currently forming in the Grenoble region (AEC and EFCIS shared its development costs).

This circuit will therefore be usable by all those who want to personalize for themselves (or rapidly have personalized) prediffused circuits. The arrays will also be offered, but for personalization by organizations or companies which have hybrid thin film installations. To our knowledge, this is the first prediffused C-MOS circuit designed and fabricated in France. Several years ago, CII-HB in collaboration with RTC, had already designed a family of prediffused circuits using very fast CML technology, which are today mass produced in Caen at RTC's bipolar plant. TRT has also designed, and recently had RTC develop, linear prediffused circuits (see ELECTRONIQUE ACTUALITES of 18 September 1981) which it is now utilizing. And finally, the former Sescosem developed three years ago a prediffused linear circuit called the Polyuse, to meet the needs of the Thomson group. This circuit should be offered next April by the new custom circuit unit of EFCIS.

Replace C-MOS 4000 Cards

One and one-half years ago, when AEC began to be interested in prediffused circuits, its major goal was to place on its own chips, that which until then required a complete printed card. And prediffused circuits offered the advantage that they could be personalized by etching the metallization layers.

Consequently, this allowed them to withhold the secrets of their circuits from a custom manufacturer. Since most integrated ca·is called for C-MOS 4000 circuits, the AEC oriented itself toward prediffused C-MOS wafers, obtaining arrays from Interdesign through ATAC Diffusion. The etching of metallized layers created no problem for AEC/DAM because it already had installations for fabricating thin- and thick-layer hybrid circuits, the first of which also require metallization etching. (Actually, it very rapidly became clear that prediffused circuits were not competitors, but rather indispensible complements, of hybrid circuits).

This was followed by the logical step for all military materiel: to have a French source of prediffused arrays. AEC thus designed its array by keeping in mind the technologic resources of EFCIS's 5 micron metal-mask C-MOS line, which was entrusted with the diffusion of the circuit, just as in the case of a conventional custom circuit designed by a user at the EFCIS reception center at Velizy (an EFCIS terminal is in fact installed at AEC).

The designed circuit, known as MAA, is an improvement of the Interdesign circuit. The basic layout of the cells is of the 3 pair/2 pair type, as in the case of most C-MOS prediffused circuits (experience has shown that this is the most practical layout), but the operating frequency of a D flip-flop for instance, can reach 5 MHz and even 15 Mhz, if the circuit is supplied at 15 V as designed, and the input/output circuits at only 5 V. Of course, this dual supply voltage requires that the chip have a voltage level converter ahead of the inputs and outputs.

Up to 15 MHz

The MAA is also fully C-MOS or TTL compatible in input and output (even if everything is supplied at 5 V), by a simple modification of the metallization mask. No pull-up resistance is therefore necessary (TTL compatibility is obtained from inverter assymetry). Up to five TTL-LS loads can be driven in this way.

The number of input and output interfaces is 22 and 28 respectively, and the total number of pads is 55. The chip measures exactly 5.08 mm on a side, so that it can be handled equally well by metric and American machines (for instance, AEC has a wafer stepper calibrated in inches, while EFCIS has machines geared to 20 micron steps).

We have stated that the basic cells were organized into 3 pair/2 pair of transistors. Since the assembly thus has 770 pairs of transistors, the user has 154 available cells to represent an elementary function (flip-flop for instance) in integrating a circuit.

Eventually, a prediffused circuit that is four times smaller, at 2.54 mm on a side, could be developed with simplified inputs and outputs, so as to leave a maximum of room for the actual cell array.

It is not within AEC's objectives to offer prediffusion services to the outside, but the organization is ready to grant specific material support in this domain to French private industry, should some users encounter difficulties in the fabrication or personalization of their circuits. In the words of Mr Kumurdjan, director of the Microelectronic Department of AEC/DAM "We are beginning to develop a certain amount of experience with prediffused circuits, and we are fortunate in having available all the necessary equipment to personalize our circuits ourselves. So, if we have to help someone out of trouble.... We have actually already collaborated with private industry." In fact, AEC/Bruyeres-le-Chatel has the design facilities, a wafer stepper installation, a far-UV exposure machine, chemical etching installations (as well as ion beam etching facilities, which however are not needed for this purpose), a tester, means for cutting wafers into chips, and mounting machines. Next year it will acquire, among others, an automatic tester and a CAO system with a powerful program for logic simulation and generation of test sequences.

11,023
CSO: 3102/58

BRIEFS

EEC MICROELECTRONICS PRODUCTION--Last week, in Brussels, the research ministers of the ten EEC member-countries, approved the launching of a community-wide program amounting to 40 million accounting units (an accounting unit is worth about 6.15 F), for the design of machines for microelectronic circuits. The project involves the construction by EEC industries, of wafer steppers, electronic maskers for wafers, plasma etching and deposition machines, and test equipment. In addition, CAO studies for VLSI (architecture, language, and structure of data, tests, device modelling) will be entrusted to industries and universities. [Text] [Paris ELECTRONIQUE ACTUALITES in French 20 Nov 81 p 1] 11,023

CSO: 3102/59

BBC WORKS ON NEW BATTERY FOR ELECTRIC CARS

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 24 Nov 81 p 5

[Article by G.M.: "BBC--One Step Closer to the Electric Car--Testing of Sodium-Sulphur Batteries"]

[Text] Brown, Boveri & Cie. (BBC), Mannheim--For 8 years the company has been working on the development of a "hot" battery operating at temperatures of 300 to 350 degrees Celsius. The battery concerned is a sodium-sulphur battery which, according to BBC, is capable of supplying four times the power of conventional lead batteries. Original ideas to utilize this battery as an aid in electrical power supply (storage) have not materialized due to economic issues. For this reason BBC has turned to the street vehicle as an area of application. In the company's opinion the sodium-sulphur basis has emerged as having the most potential for the future among other possible solutions.

Meanwhile a test battery has been tested. It is believed that the given aim can be reached at an expense of some DM 100 million; it would be a passenger car with a maximum speed of 120 to 130 km/h that accelerates to 50 km/h within 7 seconds and has a range of 250 km on one battery load. Loading would be possible overnight from a standard socket in one's own garage, although it would take about 12 hours. A different type of socket, however, would be available for quick loading. The difficult questions of infrastructure accompanying an introduction of the electric car on a wider scale are addressed by BBC by suggesting that parkometers would be conceivable as loading stations.

The battery itself, however, is only one aspect. A special suitable electric motor must be built, the manufacture of which would only be economical in large quantities (more than 100,000). This aspect is also of interest to BBC. The company even considers an electric transmission feasible some day. BBC, however, is not contemplating building entire electric cars themselves. This would be up to the auto industry. Corresponding discussions have already taken place, some with major German and U.S. manufacturers. At BBC it appears certain that major auto manufacturers have already made plans regarding electric cars. That does not mean much, however. We do not have to look at the problems of assiduous and successful improvement of combustion engines everywhere to realize the problems that would be faced trying to introduce electric cars as a means of mass transportation. Would it be accepted by the consumer at all as long as the "away from oil" slogan was

not all too pressing for him? For the time being the electric car would be a typical second car for city driving. The touring car with an electric drive is still in the pre-study stage. It is true that initially existing car types could be used; the optimal electric car, however, would have to be built differently from today's vehicle, and its design would have to be modified. This means that certain adjustments in the manufacture of cars would become necessary. BBC believes that it would not be all that much more expensive for car drivers than existing vehicles.

In addition to all of these difficulties, BBC, during their "key development," must also take into consideration the competition of other major companies working on the electric drive unit for the car. It is conceded that Chloride, a British company, might be a little further in their development of efficient batteries. BBC hopes that in 1984-85 a larger number of vehicles will feature their batteries; Chloride might be slightly ahead of them.

9544
CSO: 3102/76

BRIEFS

COAL GASIFICATION IN ITALY--The partnership of Ansaldo-Fiat-Westinghouse will build a gasification demonstration installation in the south of Italy. The process which will used was perfected by Westinghouse at its Waltz Mill pilot plant in Pennsylvania. The gas produced, with an intermediate calorific power, supplies a gas turbine; the products of combustion, whose temperature is of the order of 500 degrees C, are brought from the exhaust into a heat exchanger, where they transfer their residual heat to water, vaporizing it to supply a steam turbine. This is thus a mixed cycle. In addition, it is possible to trap certain pollutants (sulfur and carbon dioxide) during the gasification, and therefore to limit their effects on the environment. The project should be in operation in 1986, with a capability of 14 Megawatts of electric power. Other installations of this type are planned in Italy. [Text] [Paris Scoop ENERGIE in French 15 Oct 81 p 10] 11,023

COAL GASIFICATION PLANT--The board of directors of GdF has decided to build a coal gasification demonstration unit with a capacity of 1000 tons of coal per day. This plant, which will be installed at le Havre, could produce 300 million cubic meters of gas per year in 1985, to be used either as raw material for the chemical industry, or as a source of energy for large boilers. The call for bids could be issued before the end of 1981. GdF has chosen the Lurgi process presented by Creusot-Loire Industries because it can make use of coal of mediocre quality. But GdF also plans to combine it with the Texaco process, because the latter can complement it by treating the residues. This combination would have the advantage of lower production costs. In the longer range, GdF would like to achieve the production of synthetic natural gas, to replace real natural gas. An experimental methanization unit will be built for this purpose at Alfort. The importance of this project for renewed coal consumption must not be underestimated. However, one important point--financing--remains to be defined. The cost of the project is estimated at 550 MF (to which should be added 180 MF of exploitation expenses), which exceeds the self-financing capabilities of GdF. The orientation of the government's energy policy in favor of renewed coal consumption, raises the hope that it will provide financial support for this project. [Text] [Paris SEMAINE DE L'ENERGIE in French 9 Nov 81 p 13] 11,023

COAL CONVERSION FUNDS--The FRG Federal Government has decided to grant a credit of 1 GDM (by 1985) to four coal gasification projects (of Ruhrkohle, Shell, Rheinbraun, and Klockner), covering 40 to 50 percent of the financing. Three other projects (liquefaction) remain under study because of reduced public spending. A compensation of 60 DM/t will be awarded to the national coal so as to align it with imported coal. [Text] [Paris SEMAINE DE L'ENERGIE in French 9 Nov 81 p 13] 11,023

CSO: 3102/85

NEW METHOD FOR TESTING ALUMINUM PLATES FASTER, EASIER

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 23 Nov 81 p 7

[Article: "Ultrasonic Testing of Dry Aluminum Plates--Immersion in Water as Transmitting Medium Not Necessary"]

[Text] Frankfurt, 22 Nov--An ultrasonic testing device developed by British specialists in non-destructive testing of materials is probably the first of its kind worldwide to scan heavy aluminum plates by means of ultrasonic rays without their immersion in water as transmitting medium being necessary. The device tested and approved by the British Civil Aviation Authority and British Aerospace permits the Morgan-Ward Company to conduct testing much faster than was feasible so far with conventional procedures. In its present stage of extension the device built by Morgan-Ward for their testing facility will test plates made of aluminum or light metal alloys up to a length of 4 m and a width of 2 m.

The device can be easily extended to test even larger plates. During operation one plate after another is lifted by the suction cups of a lifting device and set on a mobile platform. Vacuum suction cups are used to avoid any damage to the plate surface. The platform moves the fixed plate along the x-axis across the scanning range. An ultrasonic system moving back and forth in the x-axis comprises ultrasonic probes operating at 10 MHz which are mounted on a collimator in a staggered arrangement. The collimator features a brush collar and is connected with a water column on the plate's bottom surface.

The water serving as transmitting medium is pumped up by a water container and divided into two sections to avoid a mixing with air and possible inaccuracies. The water returned from the probe collimator is removed from the plate's bottom surface following testing and fed into a reservoir where contaminations may deposit before it goes back to the pumping section. Any defect within the internal structure of the plate exceeding a limit set by the customer will trigger a warning signal. The testing is automatically interrupted; the exact location and extent of the defect can then be determined by means of conventional, portable ultrasonic devices.

In comparison with ultrasonic tests used so far, during which the plate to be tested had to be totally immersed in a water tank, this procedure offers the advantage that only the plate's bottom surface is in contact with the transmitting medium. According to the INDUSTRIAL RESEARCH AND DEVELOPMENT magazine, volume 19/1981, the upper surface will stay dry and is therefore accessible during testing.

9544
CSO: 3102/76

BRIEFS

UK, JAPAN ROBOTICS COOPERATION--Tokyo. Robotics; Anglo-Japanese negotiations. Fujitsu Fanuc Ltd., one of the first Japanese robot manufacturers, is to begin negotiations with 600 Group Ltd., the leading British manufacturer of machine tools, with a view to cooperation in the area of robotics, the 30 September edition of the newspaper NIHON KEIZAI announced. Before negotiating with the British company, Fujitsu Fanuc will consult with the German Siemens Ag group based in Munich, with which they have signed a contract to sell industrial robots on the European market, the same source indicates. Thus 600 Group Ltd. is already marketing Fujitsu Fanuc's robots in Great Britain thanks to a marketing agreement with Siemens. Anxious to become involved in the manufacture of robots itself, the British company, during a recent official British mission to Tokyo, communicated to the Ministry of International Industry and Commerce (MITI) its desire to come to a technological cooperation agreement with Fujitsu Fanuc. MITI seems disposed to encourage such collaboration, which would have the effect of reducing the friction produced by Japan's trade surplus vis-a-vis Great Britain. One recalls that the trade surplus totaled $1.8 million in 1980 and $1.2 million between January and July 1981. [Text] [Paris AFP SCIENCES in French 1 Oct 81 p 20] 9824

AEG-TELEFUNKEN, PEUGEOT COOPERATION--AEG-Telefunken is currently conducting negotiations aimed at reaching a cooperation agreement (technical developments and cross-fabrication) in the electrical equipment sector. This cooperation would extend and expand the trade agreements signed last April by the two companies, which will soon take effect. They cover the Peugeot sale to AEG of various hobby tools (electric drills and saws), with AEG supplying Peugeot with some 15 products for the professional market. In a next stage, the West German company, which is looking for partners to overcome its financial difficulties, is envisaging the creation of an independent company in the electric tool sector; Peugeot then appears as a natural choice. The electric tool sector (professional and public) of AEG-Telefunken employs 1800 people and does a business of 340 million DM. [Text] [Paris ELECTRONIQUE ACTUALITES in French 6 Nov 81 p 3] 11,023

CSO: 3102/58

SCIENCE POLICY

R&D DRAFT BUDGET FOR 1982 ADOPTED BY COUNCIL OF MINISTERS

Paris AFP SCIENCES in French 1 Oct 81 pp 2-4

[Text] The Council of Ministers at its meeting of 30 September adopted the draft budget for 1982. Total expenditures come to Fr 788.1 billion, an increase of 27.6 percent over 1981. The R&D budget is increased by 23.5 percent to Fr 23,466 billion.

The goal of a growth in R&D expenditures (public share and private) from 1.80 percent of the GDP [gross domestic product] in 1980 to 2.50 percent in 1985 has led to a substantial increase in civil budget R&D credits in 1982.

Program authorizations are upped by 35.9 percent, and general expenditures by 23.4 percent. The sum of these two categories of expenditures, which measures the real change in the research effort, represents an increase of 29.4 percent.

Concurrent with this rise in appropriations, the increase in number of new jobs created (1,727) attests the priority being given to research in the 1982 budget: This figure bears comparison with 767 new jobs created in the initial 1981 budget.

With respect to the interministerial research "envelope [French budgetary term for block sum within which individual apportionment may vary]" (see definition under chart: "Evolution of Civil Budget R&D Credits"), the policy axes being pursued are, in addition to the creation of jobs for researchers and technologists:

--The upgrading of research equipment and staffs, to make better use of their potentials;

--Development of large-scale scientific facilities;

--Implementation of prioritied sectoral efforts, such as electronics, robotics, biotechnology, and research efforts in cooperation with developing countries.

As regards technological development programs (see definition under above-mentioned chart), effort is being focused on the following sectors:

1) ANVAR [expansion unknown] and innovation: Twenty-two jobs are created to pursue the regionalization of ANVAR, in addition to the 22 jobs created and the 32 regularizations effected during 1981. ANVAR-Innovation program authorizations for 1982 increased in sum by 76 percent.

2) Computerization plan: Program authorizations under this plan are increased by 80 percent over 1981.

3) New energy sources: The development of new energy sources, a portion of which comes under the research envelope, is given a boost in a 50-percent increase in COMES [Solar Energy Commission] program authorizations.

4) Space and aeronautics programs: To pursue the space program, CNES [National Center for Space Studies] program authorizations are increased by 29 percent. Program authorizations for the major aeronautics programs are increased from Fr 1,337 million in 1981 to Fr 2,078 million in 1982, an increase of 55 percent.

The credits allotted to industry for 1982 represent a jump of 52 percent over the initial 1981 budget, to Fr 34.4 billion (program authorizations plus general expenditures).

Priority is given to general aids to industry, up 156 percent to nearly Fr 15,78 billion, which can be more easily used to fuel the jobs policy than sectoral or export aids.

FDES [Economic and Social Development Fund] allotments for loans to industry (up from Fr 1.5 billion to Fr 7 billion) are increased by a factor of 4.7 times. The PME [Small and Medium Businesses] fund is being increased by an addition of Fr 1 billion to its reserve.

Industrial policy allocations are up by a factor of 5.9 times (from Fr 237 million in 1981 to Fr 1,396 million in 1982). Together with the Fr 640 million for computerization, the total sum being allocated toward implementation of the industrial policy by the Ministry of Industry comes to over Fr 2 billion (versus less than Fr 600 million).

Appropriations for bonuses and other aides to regional development are upped by 62 percent to Fr 1,300 million. Lastly, in the food agricultural sector, program authorizations total Fr 405 million (+33 percent). This increase is centered mainly on the farming orientation bonus.

The 1982 defense budget shows an increase of 17.6 percent over 1981, with credits totaling Fr 122,855 million versus Fr 104,443 million.

Additional appropriations for strengthening the arms and services (+17.2 percent to FR 66,509 million) will specifically enable an increase of 25 percent in appropriations for operational fuel and the creation of 1,683 new jobs.

Appropriations for equipment (+18.2 percent to Fr 56,346 million) are increased mainly in the nuclear envelope (+18.5 percent) and the major conventional arms programs.

Evolution of Civil Budget R&D Credits
(in millions of francs)

Category	1981	1982	Percent Increase
1. General expenses (DO)	10,296.50	12,713.09	+23.4
2. Titles V and VI program authorizations (AP)	9,341.70	12,702.10	+35.9
3. Outpayments under existing AP's (CP)	8,697.60	10,753.69	+23.6
4. AP + DO	19,638.20	25,415.19	+29.4
5. CP + DO	18,994.10	23,466.78	+23.5
of which:			
Ministry of Research and Technology		(18,040.69)	
Other ministries		(5,426.09)	

Note: The civil budget for R&D consists of an interministerial research envelope and technological development programs, as follows:

--The interministerial research envelope contains credits for basic and exploratory research and credits for applied research.

--The technological programs include the credits for development; these programs are positioned downstream, in the research process, from the work done under the interministerial research envelope.

(A more detailed analysis of the different budgetary sectors involving R&D will be given in forthcoming AFP SCIENCES bulletins).

Environmental Budget: Fr 82,529.81 million

National Meteorological Budget: 556.14 million

9238
CSO: 3102/55

CIVIL RESEARCH BUDGET RECEIVES PRIORITY STATUS IN FRANCE

Paris AFP SCIENCES in French 15 Oct 81 pp 1-16

[Text] Paris--A total of some Fr 52 billion is being allocated in the draft 1982 national budget to research and technological development in the public sector, said Mr Jean-Pierre Chevenement, minister of research and technology, in releasing his budget to the press on 12 October. For 1981, this figure may be estimated, after revisions, at around Fr 38 billion, instead of the Fr 31 billion at which it had originally been estimated last year.

To evaluate the total national R&D effort, it will probably be necessary to add, for the coming year, some Fr 20 billion, bringing the total to over Fr 70 billion.

As shown by one of the appended tables, military research expenditures for 1982 are estimated at some Fr 17.6 billion (a figure that is likely to be revised after the actuals are in and the real expenditures are known).

The civil research budget, excluding the PTT [Post and Telecommunications] supplementary budget (Fr 3.15 billion) and the "miscellaneous" other ones, notably the one for remuneration of teaching reasearchers (Fr 6 billion), will total Fr 24.4 billion, of which Fr 16.3 billion represent the interministerial research "envelope" [French budgetary term for block sum within which individual apportionment may vary], and the technological development programs budget will total Fr 9.1 billion.

As we have indicated in a previous article (see AFP SCIENCES No 277 of 1 October 1981, pp 2-4), the draft civil research budget, which is to be submitted to Parliament, represents a growth rate of the order of 29.6 percent, or, double that between the 1980 and 1981 budgets, which amounted to 16.8 percent. According to Mr Chevenement, "This is a quantitative break with past trends, a positive and decisive break."

The civil research budget thus becomes one of the national budget's first priorities. It constitutes a first stage toward the objective the government has set for itself, namely, to bring the national expenditure on research and technological development up to 2.5 percent of the GDP [gross domestic product] by 1985.

Although the increase in program authorizations and in general expenses appropriations is very adequate,the same cannot be said for the increase in outpayment credits (15 percent over the 1981 total), which Mr Chevenement recognizes is "a matter of concern." Necessary corrections will have to be made in this respect.

Following are the main features of this civil research budget, according to Mr Chevenement:

1. Priority to Employment.

This is exemplified by the creation of 1,727 new jobs, which are in addition to the 625 supplementary jobs created by the budget amendment of July this year (under extraordinary credits in the national budget). These new jobs, together with the measures improving the pay and allowances of engineers, technicians and administrative employees involved in research, are intended to provide new stimulus to the scientific and technical employment policy, which is indispensable to the growth of research.

2. Upgrading of Equipment.

This has to do with restoring to adequate levels the working facilities available to researchers, "which have undergone considerable degradation over the years." This is why, the minister indicated, "a special effort will be made--under the 1982 budget--to increase support credits for programs, which make up the day-to-day operations of the laboratories, and credits for equipment (intermediate equipment and large-scale scientific facilities).

The program authorizations will make it possible to:

--Begin immediately the upgrading of the operational facilities of research laboratories, which have undergone serious degradation over the past few years;

--Actualize the part of the 1982 plan providing for large-scale national and international scientific facilities especially in the domains of physics, space and oceanography (for example: the TORE SUPRA thermonuclear fusion reactor; the high-flux reactor of the Laue-Langevin Institute (Franco-Anglo-German); construction of the INAG [National Astronomy and Geophysics Institute] of the IRAM [Institute of Millimetric Radio Astronomy] in cooperation with Germany; installation of vectorial calculator; the Super ACO synchrotron radiation machine);

--Undertake research programs in the prioritied sectors in which the Ministry of Research and Technology has already begun to place missions.

3. The Prioritied Sectors.

In response to a question, Mr Chevenement had to agree that there has been very little change in the listing of sectors in this category over the one that had already been set up by the previous government, but said that "It takes more than just a few months to change things." In any case, the nationwide symposium is there to help define the new priorities, which will then be taken into consideration in the programs budget.

The sectors involved must have a strategic bearing on the independence of the nation, the competitiveness of its economy and the institution of a new model of growth. Six study missions have therefore been created in the following domains:

--Biotechnology;

--Rational use of energy, and new energy sources, supplemented by a geothermal energy mission;

--Electronics;

--Robotics;

--Research, employment and improvement of working conditions;

--Scientific and technical cooperation with the developing countries.

In 1982, the resources necessary for the development of research in these domains will be drawn from the agencies concerned and reinforced by supplementary financing from R&D funds.

4. Special attention is given to providing incentives for the development of industrial research and innovation. More than Fr 900 million are provided for this purpose.

As regards technological development programs, Fr 9,122.3 million are being provided for their funding in 1982.

In 1981, this funding totaled Fr 6.7 billion. The increase over 1981 amounts to 35.8 percent, as compared with a 14.9-percent increase in 1981 over 1980.

These programs, which do not include technological development programs in telecommunications, are the following:

Programs	AP + DO [*] (in millions of francs)	
Nuclear electronics program (CEA [Atomic Energy Commission])	3,395.6	
Space applications (CNES [National Center for Space Studies])	1,745.6	
Seabed mining program (nodules)	60	
Solar energy (COMES [Solar Energy Commission])	100	(1)
Informatics industries and applications (computerization plan)	658.3	
Informatics Agency (ADI)	167.5	(2)
Major civil aeronautics programs	2,078	(3)
Innovation (ANVAR [National Agency for the Valorization of Research] and DIT [Delegation for Innovation and Technology])	917.3	(4)
Total	9,122.3	

[*] AP=program authorizations; DO=general expenses.

[Footnotes to table on preceding page]:

(1) With the credits from the interministerial research envelope, the total budget of the COMES for 1982 will come to Fr 300 million, representing an increase of 52.4 percent over 1981.

(2) With the credits from the interministerial research envelope, the total budget of the ADI will come to Fr 280 million in 1982.

(3) These appropriations provide for the launching of the Airbus A 320 and of a new program for the development of "increased-fuel-economy engines."

(4) The credits for 1982 will enable the development of regional ANVAR agencies: 44 stations for these agencies, half of which were provided for in the amended budget adopted in July1981 and half being provided under the 1982 budget. These credits intended for aid to innovation will total Fr 720 million in 1982. They should be substantially increased, considering their role as regards incentives to the development of industrial research in the PMI [Small and Medium Business] sector, especially at the regional level.

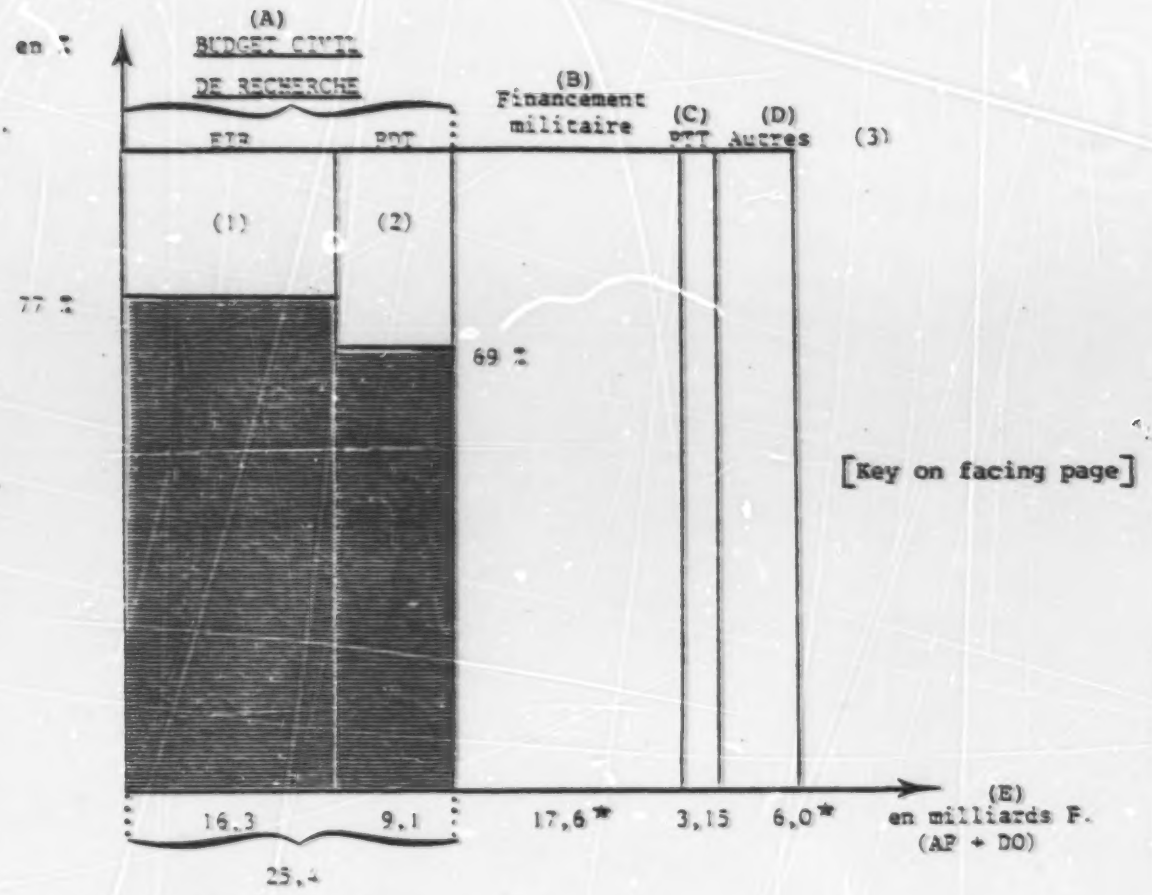
As regards the major research entities, see the appended tables.

One last but important point is that of scientific and technological information.

Considering its basic importance to the growth of research and technological development activities, be it in the form of data bases and banks, dissemination of scientific and technical knowledge, or publishing, credits for the scientific and technological information domain are being increased by more than 40 percent over 1981.

Public Funding of Research and Technological Development

Draft Budget for 1982



*estimations [estimates]

(F) Dotation budgétaire du Ministère de la Recherche et de la Technologie (MRT)

(G) EIR : Enveloppe interministérielle de recherche

(H) PDT : Programmes de développement technologique

(I) AP : Autorisations de programme

(J) DO : Dépenses ordinaires

(K) (1) : Organismes publics de recherche, services techniques, crédits d'intervention hors budget du MRT

(L) (2) : PDT dont les dotations ne figurent pas au budget du MRT (aéronautique civile, plan informatisation, programme minier sous-marin)

(M) (3) : pour l'essentiel, part de la rémunération des enseignants-chercheurs comptabilisée dans l'effort public de R. et D.

Public Funding of Research and Technological Development

Draft Budget for 1982

[continued from facing page]

Key to table on facing page:

A. Civil Research Budget.

B. Military Funding.

C. Post and Telecommunications.

D. Others (3)

E. In billions of francs--for AP and DO see key items I and J.

F. Budgetary allocation to the MRT [Ministry of Research and Development].

G. EIR: Interministerial Research Budget.

H. PDT: Technological development programs.

I: AP: Program authorizations.

J. DO: General expenses.

K. (1): Public sector research organizations and technical services, interventional credits outside the MRT budget.

L. (2): PDT for which appropriations are not included in the MRT budget (civil aeronautics, computerization plan, seabed mining program).

M. (3): Mainly, that portion of teaching researchers remuneration covered by public funding of R & D.

Draft Budget for 1982

The Pivotal Figures

Civil Research Budget

Item	1982	1981	Increase over 1981 (in percent)
AP* + DO**	25.4 MMF***	19.6 MMF***	29.6
Jobs created	1727	635 initial budget 625 supplementary budget (July 1981) 1260	37.1

Notes:

Between July 1981 and 1982, a total of 625 + 1727 = 2352 new jobs have been created.

* AP = program authorizations.

** DO = general expenses.

*** MMF = billion francs.

Draft Budget for 1982 [cont'd]

The Pivotal Figures

Interministerial Research Budget

Item	1982	1981	Increase over 1981 (in percent)
AP* + DO**	16.3 MMF***	12.9 MMF***	26.4
Jobs created	1580 620 ch# - 630 ITA# 30 ad cent# 300 reserved jobs	1250 555 ch# - 695 ITA#	26.4

Notes:

AP (program support and equipment):

1982: 6.0 MMF — 1981: 4.6 MMF — Increase: 32 percent

DO:

1982: 10.3 MMF — 1981: 8.3 MMF — Increase: 28 percent

CP****:

1982: 5.0 MMF — 1981: 4.3 MMF — Increase: 15 percent

* AP = program authorizations.
** DO = general expenses.
*** MMF = billion francs.
**** CP = outpayment credits.
#: ch = researchers; ITA = engineers, technicians, administrators; ad cent = central administration.

Technological Development Programs

Item	1982	1981	Increase over 1981 (in percent)
AP* + DO**	9.1 MMF***	6.7 MMF***	35.8
Jobs created	147	10	

* AP = program authorizations.

** DO = general expenses.

*** MMF = billion francs.

Evolution of Research Expenditures in France

Item	1959	1963	1967	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
DIRD* (millions of current francs)	3,078	6,392	12,228	16,621	18,277	19,789	23,031	26,203	29,774	33,185	37,671	44,123	50,500
DIRD (millions of 1967 (1) constant francs)	4,169	7,261	12,228	13,379	13,838	13,912	14,512	14,579	15,046	15,396	15,920	16,868	17,315
Average annual increase in volume		14.9	13.9	5.0	3.4	0.5	4.3	0.5	3.2	2.3	3.4	6.0	2.6
DIRD/PIB** in percent	1.15	1.58	2.16	1.91	1.86	1.78	1.80	1.80	1.78	1.76	1.76	1.81	1.83

* DIRD = domestic expenditure on research and development; this figure represents the total spent on R & D work done within the national territory.

** PIB = gross domestic product.

(1) PIB price index.

x = tentative data.

Research Effort in Foreign Countries

Country	DIRD* billions of francs(1)		DIRD/PIB** in percent		DIRD/inhabitant in francs(1)	
	1978	1979x	1978	1979x	1978	1979x
United States	226.4	240.4	2.38	2.41	1,036	1,090
Japan	86.9	89.3	1.93	2.03	756	770
Germany	62.2	70.6	2.15	2.17	1,014	1,151
France	37.7	44.1	1.76	1.81	707	825
United Kingdom	30.6		2.16		547	
Italy	9.9	11.5	0.84	0.84	175	203

* DIRD = domestic expenditure on R & D; this figure represents the total spent on R & D work done within the national territory.

** PIB = gross domestic product.

(1) At current exchange rates.

x = estimates.

Evolution of Intensity of R & D Effort in France and Abroad

Country	DIRD*/PIB** in percent				
	1964	1969	1973	1977	1979(1)
United States	3.1	2.9	2.5	2.4	2.4
Germany	1.4	1.8	2.1	2.1	2.2
United Kingdom	2.3	2.3	2.1x	2.1xx	2.2xxx
Japan	1.5	1.6	1.9	1.9	2.0
France	1.8	2.0	1.8	1.8	1.8
Italy	0.7	0.8	0.9	0.9	0.8

* DIRD = domestic expenditure on R & D; this figure represents the total spent on R & D work done within the national territory.

** PIB = gross domestic product.

x = 1972; xx = 1975; xxx = 1978.

(1) tentative data.

Research Funding and Executive Structures in France

(millions of francs)

Item	1959	1963	1967	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980(1)
DNRD*	3,123	6,437	12,348	16,779	18,330	19,831	23,011	26,183	29,772	33,062	37,677	43,990	50,500
Financing by administrations(2)	2,173	4,424	8,770	10,617	11,451	12,179	14,130	15,735	17,226	19,114	21,682	24,641	28,800
Financing by private enterprise	950	2,013	3,578	6,162	6,879	7,652	8,881	10,448	12,546	13,948	15,995	19,349	21,700
Administration funding/ DNRD in percent	0.70	0.69	0.71	0.63	0.62	0.61	0.61	0.60	0.58	0.58	0.58	0.56	0.57
DIRD**	3,078	6,392	12,228	16,621	18,277	19,789	23,031	26,203	29,774	33,185	37,671	44,123	50,500
Execution by administrations(2)	1,678	3,277	5,936	7,284	7,707	8,265	9,500	10,586	11,782	13 186	15,171	17,863	20,300
Execution by private enterprise	1,400	3,115	6,292	9,337	10,570	11,524	13,531	15,617	17,992	19,999	22,500	26,260	30,200
Execution by enterprises/ DIRD in percent	0.45	0.49	0.51	0.56	0,58	0.58	0,59	0.60	0.60	0.60	0.60	0.60	0.60

* DNRD = gross national expenditure on R & D.

** DIRD = domestic expenditure on R & D; this figure represents total spent domestically on R & D work done within the national territory.

(1) = Estimate.

(2) = Public and private administrations (state, higher education, and nonprofit institutions).

Sources of Financing of Research and Development Budgets

By Branches of Industry in 1979

Branch	Public Funding	Financed by Enterprise's Own Funds	Other Financing (1)	Total
	Millions of Francs	Percent		
Aeronautics	3,378	58	29	13	100
Electronics	1,501	28	57	15	100
Chemical	294	11	75	14	100
Energy	108	5	79	16	100
Engineering	97	23	28	49	100
Electric	91	9	86	5	100
Automobile	13	1	97	2	100
Other industries	322	4	82	14	100
All enterprises	5,804				

(1) Subcontracts received from other firms, from abroad, etc.

Principal Components of R & D Budgetary Funding

Component	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Research envelope (AP* + F**)	5,436	6,319	6,884	7,742	9,618	10,298	10,962	11,962	13,374	15,792
Research envelope (CP*** + F)	5,173	6,128	6,862	7,642	9,777	10,286	10,646	11,747	13,346	15,400
Military funding	3,900	3,900	4,350	4,650	5,050	5,600	6,100	7,550	9,350	11,350
University research funding	1,053	1,062	1,145	1,239	1,440	1,691	1,973	2,131	2,493	2,816
Civil aeronautics subvention	669	754	624	420	783	666	692	709	765	604
Post and Telecommunications	325	380	454	587	690	764	915	985	1,090	1,350
Others(x)	74	85	86	110	119	140	146	174	210	250
Total	11,194	12,309	13,521	14,648	17,859	19,147	20,472	23,296	27,254	31,770
Research envelope percentage of total	46.2	49.8	50.8	52.2	54.7	53.7	52.0	50.4	49.0	48.5

x Certain public bodies perform research and development that is difficult to dissociate from their general activities (National Institute of Statistics and Economic Studies, Bridges and Roads regional laboratories, agricultural and veterinary schools, Quality Research and Studies Center); the credits indicated on this line are an estimate of the funding pertaining to this work.

* AP = program authorizations.

** F = [expansion unknown].

*** CP = Outpayment credits.

Technological Development Program (PDT)

(millions of francs)

Program	General Expenses (DO)		Program Authorizations (AP)		Outpayment Credits (CP)		Total (DO + AP)	
	DO-1981	DO-1982	AP-1981	AP-1982	CP-1981	CP-1982	1981	1982
Electronuclear program	1,601.3	1,995.0	1,361.6	1,400.6	1,317.6	1,062.0(1)	2,962.9	3,395.6
Space applications	270.4	327.1	1,029.0	1,418.5	924.1	1,301.5(2)	1,299.4	1,745.6
Oceanic domain interventions (Ministry of Industry)	--	--	10.0	60.0	7.2	43.0	10.0	60.0
Solar energy interventions	--	--	65.4	100.0	35.0	71.0(3)	65.4	100.0
ANVAR	39.8	67.3	450.5	760.0	342.1	620.0	490.3	827.3
Innovational support	--	--	46.5	90.0	84.0	65.0	46.5	90.0
Informatics Agency	25.1	35.5	114.4	132.0	48.1	135.0(4)	139.5	167.5
Computerization plan (Ministry of Industry)	13.4	18.3	355.0	640.0	273.4	462.6	368.5	658.3
Large-scale civil aeronautics programs (Ministry of Transport)	--	--	1,337.0	2,078.0	1,331.5	1,989.0	1,337.0	2,078.0
Total PDT	1,950.0	2,443.2	4,769.4	6,679.1	4,363.0	5,749.1	6,719.5	9,122.3

(1) Of which Fr 180.0 million is for services voted under the Bleu "Industrie" [reference is unclear].
(2) " " Fr 75.0 million " " " " " " " "
(3) " " Fr 21.0 million " " " " " " " "
(4) " " Fr 66.0 million " " " " " " " "

Interministerial Budget for Research

New Jobs in the 1981 and 1982 Budgets

	Initial Finance Law 1981			Amended Finance Law 1981			Total Jobs Created for 1981			Finance Law 1982 (1)		
	Ch.	ITA	Total	Ch.	ITA	Total	Ch.	ITA	Total	Ch.	ITA	Total
Ministry for Scientific Research and Technology												
Central Administration	-	1	1	-	-	-	-		1	-	30	30
ANVAR [National Agency for the Valorization of Research]	-	-	-	-	54(2)	54	-	54	54	-	22	22
CNRS [National Center for Scientific Research]	240	41	281	99	130	229	339	171	510	348	160	508
INSERM [National Institute for Health and Medical Research]	55	35	90	13	45	58	68	80	148	65	90	155
Pasteur Institute	-	-	-	-	-	-	-	-	-	6	15	21
INRA [French Institute for Agronomical Research]	38	48	86	14	60	74	52	108	160	55	117	172
COMES [Solar Energy Commission]	-	20	20	-	28	28	-	48	48	-	10	10
CNEXO [National Center for the Exploitation of Oceans]	5	4	9	12	53(3)	65	17	57	74	15	12	27
ISTPM [Scientific and Technical Institute for Sea Fishing]	2	2	4	-	6	6	2	8	10	4	11	15
ADI [Data Processing Agency]	-	-	-	-	27(4)	27	-	27	27	-	-	-
INRIA [National Institute of Data Processing and Automation Research Rocquencourt]	5	4	9	5	12	17	10	16	26	10	18	28
CNES [National Space Studies Center]	-	-	-	-	-	-	-	-	-	-	25	25
CEA [Atomic Energy Commission]	-	-	-	-	-	-	-	-	-		100	100
ORSTOM [Overseas Scientific and Technical Research Office]	11	7	18	3	5	8	14	12	26	20	15	35
GERDAT [Study and Research Group for the Development of Tropical Agronomy]	12	-	12	4	4	8	16	4	20	20	15	35
Total for the Ministry of Research and Technology	368	162	530	150	424	574	518	586	1104	543	640	1183
Workers												
INED [National Institute for Demographic Studies]	2	1	3	1	1	2	3	2	5	1	3	4
CEE [Employment Studies Center]	1	2	3	1	2	3	2	4	6	1	3	4
Education												
Research Mission	4	20	24	-	10	10	4	30	34	4	80	84
Transportation												
EERM [Establishment for Meteorological Study and Research]	2	-	2	-	3	3	2	3	5	3	4	7
IRT [Transportation Research Institute]	-	-	-	-	-	-	-	-	-	7	3	10

[continued]

[continuation of Table: New Jobs in the 1981 and 1982 Budgets]

	Initial Finance Law 1981			Amended Finance Law 1981			Total Jobs Created for 1981			Finance Law 1982 (1)		
	Ch.	ITA	Total	Ch.	ITA	Total	Ch.	ITA	Total	Ch.	ITA	Total
Culture												
Research Mission	6	4	10	-	9	9	6	13	19	10	18	28
Housing												
Town Planning												
LCPC [Central Laboratory for Bridges and Roadways]	2	2	4	-	2	2	2	4	6	3	5	8
CSTB [Scientific and Technical Center for Building]	6	9	15	-	5	5	6	14	20	6	7	13
Justice	-	-	-	-	-	-	-	-	-	-	-	-
Land Planning and Management	2	1	3	-	-	-	2	1	3	-	-	-
Agriculture												
ACTA [Association for Technical Coordination of Agriculture]	-	-	-	-	-	-	-	-	-	-	-	-
CEMAGREF	-	7	7	-	5	5	-	12	12	2	5	7
Health - SCPRI [Central Service for Protection Against Ionizing Radiation]	-	-	-	-	-	-	-	-	-	-	-	-
DOM-TOM [Overseas Departments - Overseas Territories												
TAAF [French Southern and Antarctic Lands	-	-	-	-	-	-	-	-	-	-	-	-
Ministry of Industry												
Mining Schools	17	7	24	2	10	12	19	17	36	10	10	20
IRCHA [Institute for Applied Chemical Research]	-	-	-	-	1	1	-	1	1	-	2	2
BNM [National Metrology Office]	-	-	-	-	-	-	-	-	-	-	2	2
BRGM [Bureau of Geological and Mining Exploration]	-	-	-	-	-	-	-	-	-	10	15	25
Data Processors											10	10
Total General	610	215	625	154	472	626	564	687	1251	600 (1)	807 (1)	1407 (1)

(1) Not included - 320 positions reserved for the MRT [Ministry for Research and Technology]
(2) Included is the integration of 32 officers into ANVAR.
(3) Included is the integration of 34 officers of CNEXO.
(4) Included is the integration of 15 officers into CESIA.

1981 Manpower of the Interministerial Budget for Research

Sectors — Bodies	Manpower 1980		Jobs Created Initial Finance Law 1981		Jobs Created Total 1981		Total Manpower 1981		
	Ch.	ITA	Ch.	ITA	Ch.	ITA	Ch.	ITA	Total
Ministry for Scientific Research and Technology									
DGRST [General Delegation for Scientific and Technical Research]	-	191	-	-	-	-	-	191	191
MIDIST [Interministerial Mission on Scientific and Technical Information]	-	8	-	1	-	-	-	9	9
DIT [Telecommunications Information Documents]	-	28	-	-	-	-	-	28	28
ANVAR [National Agency for the Valorization of Research]	-	145	-	-	-	54 (1)	-	199	199
CNRS [National Center for Scientific Research]	8 875	14 224	240	41	99	130	9 214	14 395	23 609
INSERM [National Institute for Health and Medical Research]	1 436	2 227	55	35	13	45	1 504	2 307	3 811
INRA [French Institute for Agronomical Research]	1 244	6 067	38	48	14	60	1 296	6 175	7 471
COMES [Solar Energy Commission]	-	62	-	20	-	28	-	110	110
CNEXO [National Center for the Exploitation of Oceans	104	387	5	4	12	53(2)	121	444	565
ISTPM [Scientific and Technical Institute for Sea Fishing]	123	156	2	2	-	6	125	164	289
ADI [Data Processing Agency]	-	119	-	-	-	27 (3)	-	146	146
INRIA [National Institute of Data Processing and Automation Research]	151	213	5	4	5	12	161	229	390
CNES [National Space Studies Center]	273	807	-	-	-	-	273	807	1 080
CEA [Atomic Energy Commission]	1 650	3 250	-	-	-	-	1 650	3 250	4 900
ORSTOM [Overseas Scientific and Technical Research Office]	640	682	11	7	3	5	654	694	1 348
GERDAT [Study and Research Group for the Development of Tropical Agronomy]	459	466	12	-	4	4	475	470	945
Workers									
INED [National Institute for Demographic Studies]	46	90	2	1	1	1	49	92	141
CEE [Employment Studies Center]	24	31	1	2	1	2	26	35	61
National Education									
Research Mission	12	716	4	20	-	10	16	746	762
Transportation									
EERM [Establishment for Meteorological Study and Research]	142	89	2	-	-	3	144	92	236
IRT [Transportation Research Institute]	73	123	-	-	-	-	73	123	196
DFCEM	-	2	-	-	-	-	-	2	2

[continued]

[continuation of Table: 1981 Manpower of the Interministerial Budget for Research]

Sectors / Bodies	Manpower 1980		Jobs Created Initial Finance Law 1981		Jobs Created Total 1981		Total Manpower 1981		
	Ch.	ITA	Ch.	ITA	Ch.	ITA	Ch.	ITA	Total
Cultural									
Research Mission	140	250	6	4	-	9	146	263	409
Justice	12	67	-	-	-	-	12	67	79
Housing-Town Planning									
LCPC [Central Laboratory for Bridges and Roadways]	110	247		2	-	2	112	251	363
CSTB [Scientific and Technical Center for Buildings]	109	174	6	9	-	5	115	188	303
Agriculture									
CEMAGREF	65	132	-	7	-	5	65	144	209
ACTA [Association for Technical Coordination of Agriculture]	23	22	-	-	-	-	23	22	45
Industry									
Mining Groups	138	145	17	7	2	10	157	162	319
IRCHA [Institute for Applied Chemical Research]	35	89	-	-	-	1	35	90	125
BNM [National Metrology Office]	-	10	-	-	-	-	-	10	10
BRGM [Bureau of Geological and Mining Exploration]	170	173	-	-	-	-	170	173	343
BNIST [National Scientific and Technical Information Office and others]	-	2	-	-	-	-	-	2	2
Ministry of Health									
SCPRI [Central Service for Protection Against Territories]	-	127	-	-	-	-	-	127	127
Ministry of Planning	2	8	2	1	-	-	4	9	13
DOM-TOM [Overseas Departments - Overseas Territories]									
TAAF [French Southern and Antarctic Lands]	-	42	-	-	-	-	-	42	42
Environment	24	55	-	-	-	-	24	55	79
Total	16 080	31 626	410	215	154	472	16 644	32 313	48 957

(1) Included is the integration of officers into ANVAR (32 jobs)
(2) to CNEXO (54 jobs)
(3) to CESIA (15 jobs)

Ministry of Research and Technology

Breakdown of Endowments for 1982 in the MRT's Budget Plan (program authorizations (AP), payment appropriations (CP), ordinary expenses (DO))

(in millions of francs)

Ministry of Scientific Research and Technology Agency Organizations		Program Authorizations AP 1981	AP 1982	Payment Appropriations CP 1981	CP 1982	Ordinary Expenses DO 1981	DO 1982	Total AP + DO 1981	1982
Ministry's intervention resources									
Funds + 56-00 MIDIST [Interministerial Mission on Scientific and Technical Information] DGRST [General Directorate for Scientific and Technical Research], research allocations and others		578,400	735,000	471,734	575,000	208,990 including extraordinary credits	296,554	787,390	1,031,554
DIT [Delegation for Innovation and Technology]	EIR [Interministerial Research Envelope]	2,500	30,000	2,500	10,000	3,713	4,214	6,213	34,214
	PDT [Technological Development Programs]	46,470	90,000	94,000	65,000	-	-	46,470	90,000
	Total DIT	48,970	120,000	96,500	75,000	3,713	4,214	52,683	124,214
ANVAR [National Agency for the Valorization of Research]	PDT	450,532	760,000	342,132	620,000	39,788	67,326	490,320	827,326
Total intervention resources	EIR	580,900	765,000	474,234	585,000	212,703	300,768	793,603	1,065,768
	PDT	497,002	850,000	436,132	685,000	39,788	67,326	536,790	917,326
	total	1,077,902	1,615,000	910,366	1,270,000	252,491	368,094	1,330,393	1,983,094
CNRS - National Center for Scientific Research and national institutes		1,040,000	1,378,400	1,023,800	1,176,000	3,709,340	4,567,827	4,749,340	5,946,227
INSERM [National Institute for Health and Medical Research]	EIR	268,500	352,000	255,000	312,000	566,145	689,674	834,645	1,041,674
Paris	EIR	48,500	68,000	42,490	62,000	61,624	75,307	110,124	143,307
Lille	EIR	5,000	8,000	5,000	9,000	-	-	5,000	8,000
total health		322,000	428,000	302,490	383,000	627,769	764,981	949,769	1,192,981
INRA [French Institute for Agronomical Research]		220,000	295,000	212,000	249,000	998,062	1,214,207	1,218,062	1,509,207

[continued]

[continuation of Table: Breakdown of Endowments for 1982 in the MRT's Budget Plan]

Ministry of Scientific Research and Technology Agency	Organizations	Program Authorizations AP 1981	Program Authorizations AP 1982	Payment Appropriations CP 1981	Payment Appropriations CP 1982	Ordinary Expenses DO 1981	Ordinary Expenses DO 1982	Total AP + DO 1981	Total AP + DO 1982
CEA [Atomic Energy Commission]	EIR	449,700	615,000	421,300	368,000	1,054,060	1,251,200	1,503,760	1,866,200
	PDT	1,361,200	1,400,600	1,317,600	882,000	1,601,300	1,995,000	2,962,500	3,395,600
total	CEA	1,810,900	2,015,600	1,738,900	1,250,000	2,655,360	3,246,200	4,466,260	5,261,800
CNES [National Center for Space Studies]	EIR	378,100	400,000	370,000	373,000	-	-	378,100	400,000
	PDT	1,028,980	1,418,470	924,080	1,226,464	270,400	327,115	1,299,380	1,745,585
total	CNES	1,407,080	1,818,470	1,294,080	1,599,464	270,400	327,115	1,677,480	2,145,585
CNEXO [National Center for Exploitation of the Oceans]	EIR	200,355	264,030	187,555	206,030	103,674	136,350	304,029	400,380
ISTPM [Scientific and Technical Institute for Ocean Fishing]	EIR	10,450	35,000	10,350	21,100	47,047	57,973	57,497	92,973
total	net	210,805	299,030	197,905	227,130	150,721	194,323	361,626	493,353
COMES [Solar Energy Commission]	EIR	121,800	180,000	97,400	71,000	12,108	20,000	133,908	200,000
	PDT	65,400	100,000	35,000	50,000	-	-	65,400	100,000
total	COMES	187,200	280,000	132,400	121,000	12,108	20,000	199,308	300,000
ADI [Data Processing Agency]	EIR	76,000	115,000	59,000	49,000	-	-	76,000	115,000
	PDT	114,440	132,000	48,120	69,000	25,060	35,500	139,500	167,500
total	ADI	190,440	247,000	107,120	118,000	25,060	35,500	215,500	282,500
INRIA [National Institutes of Data Processing and Automation Research-Rocquencourt]	EIR	41,600	65,000	36,600	44,000	72,270	91,876	113,870	156,876
Total for data processing		232,040	312,000	143,720	162,000	97,330	127,376	329,370	439,376

[continued]

[continuation of Table: Breakdown of Endowments for 1982 in the MRT's Budget Plan]

Ministry of Scientific Research and Technology Agency	Organizations	Program Authorizations AP 1981	AP 1982	Payment Appropriations CP 1981	CP 1982	Ordinary Expenses DO 1981	DO 1982	Total AP + DO 1981	1982
Pasteur Overseas	EIR	2,800	4,000	2,800	4,000	7,496( )	8,816	10,296( )	12,816
ORSTOM [Overseas Scientific and Technical Branch Office]	EIR	53,300	71,000	54,800	69,000	317,734	390,048	371,034	461,048
GERDAT [Study and Research Group for the Development of Tropical Agronomy]	EIR	56,350	75,000	56,950	74,000	185,594	227,122	241,944	302,122
	total OM	112,450	150,000	114,550	147,000	510,824	625,986	623,274	775,986
Total for Ministry of Research and Technology									
I	EIR	3,553,355	4,690,430	3,309,279	3,672,130	7,347,857	9,031,168	10,901,212	13,721,598
II	PDT	3,067,022	3,901,070	2,760,932	2,912,464	1,936,548	2,424,941	5,003,570	6,326,011
III	Total	6,620,377	8,591,500	6,070,211	6,584,594	9,284,405	11,456,109	15,904,782	20,047,609

NB: It is appropriate here to point out credits for the whole 1981 budget:

(1) ANVAR AP 60,000 CP 30,000 Budgeted for the Ministry
CNEXO AP 1,419 CP 1,419 of Industry

(2) The cost of job creations in 1981 projected for the total:
MRT 23,058 MF (million francs) included in the 208,990 MF
CNEXO 3,256 MF
COMES 1,750 MF budgeted for the Ministry of Industry
ADI 1,687 MF
ANVAR 1,400 MF

(3) including transfers from the Ministry of Industry (from BNIST [National Office for Scientific and Technical Information] and SEPOR [expansion unknown]

(4) IPOM: [expansion unknown] 4,050 comes under the Budget for Cooperation

Also included under Ordinary Expenses for some organizations are transfers between ministries.

(in millions of francs)

Ministry/Organization	Program Authorizations AP 1981	AP 1982	Payment Appropriations CP 1981	CP 1982	Ordinary Expenses DO 1981	DO 1982	Total TTC (AP+DO) 1981	1982
Ministry of State for Interior and Decentralization	4,200	5,000	3,200	6,900	0,297	0,334	4,497	5,334
Ministry of Transportation								
IRT [Transportation Research Institute	10,500	21,000	10,500	19,000	34,901	42,772	45,401	63,772
Meteorology	28,600	34,000	28,000	32,000	34,831	41,668	63,431	75,668
Incentive Actions								
Research Mission	125,600	173,000	123,600	125,000	0,418	0,473	126,018	173,473
--Civil Aviation	96,000	134,000	96,300	98,000	-	-	96,000	134,000
--Other incentives	29,600	39,000	12,500	27,000	-	-	29,600	39,000
Total	164,700	228,000	162,100	176,000	70,150	84,913	234,850	312,913
Ministry of the Plan	13,500	15,700	10,500	13,000	2,474	2,745	15,974	18,445
Ministry of Justice	-	-	-	-	10,262	11,597	10,262	11,597
Ministry of External Relations	-	-	-	-	429,259	482,250	429,259	482,250
Secretary of State for the Ministry of the Interior in charge of:								
DOM-TOM [Overseas Departments-Overseas Territories]								
DOM-TAAF [Overseas Departments - French Southern and Antarctic Lands]	6,800	14,000	6,800	9,800	15,269	17,427	22,069	31,427
Ministry of National Education	569,300	719,200	573,200	709,200	100,116	138,886	669,416	858,086
Ministry of Agriculture								
Central Administration (research allocations)	-	-	-	-	4,928	4,928	4,928	4,928
CEMAGREF [expansion unknown]	7,300	12,000	7,300	8,800	20,206	25,117	27,506	37,117
ACTA [Association for Technical Coordination of Agriculture]	6,300	8,000	9,000	5,900	5,969	6,931	12,269	14,931
IAA [Agricultural and Alimentary Industries]	10,000	13,000	6,000	8,800	-	-	10,000	13,000
Total	23,600	33,000	22,300	23,500	31,103	36,976	54,703	69,976

[continued]

[continuation of Table]

Ministry/Organization	Program Authorizations AP 1981	AP 1982	Payment Appropriations CP 1981	CP 1982	Ordinary Expenses DO 1981	DO 1982	Total TTC (AP+DO) 1981	1982
Ministry of Industry								
Central Administration from SEPOR BNIST [National Scientific and Technical Information Office]	-	-	-	-	1,923	0,115	1,923	0,115
Mining Schools	6,700	13,800	6,700	9,300	56,476	68,051	63,176	81,851
IRCHA [Institute for Applied Chemical Res.]	9,500	11,200	9,500	11,000	23,752	28,110	33,252	39,310
BRGM [Bureau of Geological and Mining Exploration]	40,900	57,000	42,500	51,300	56,302	69,467	97,202	126,460
BNM [National Metrology Office]	9,170	13,000	9,170	7,800	7,899	9,179	17,069	22,179
Total	66,270	95,000	67,870	79,400	146,352	174,922	212,622	269,922
Ministry of Culture	20,670	30,000	21,570	27,500	51,729	64,590	72,399	91,590
Ministry of Labor								
INED [National Institute for Demographic Studies]	6,200	8,000	6,000	7,500	22,271	27,030	28,471	35,030
CEE [Employment Studies Center]	2,100	2,700	2,000	2,000	8,808	11,405	10,908	14,105
Total	8,300	10,700	8,000	9,500	31,079	38,435	39,379	49,135
Ministry of Health								
SCPRI [Central Service for Protection Against Ionising Radiation]	6,500	8,500	6,500	8,500	20,186	23,568	26,686	32,068
Curie Institute	2,600	4,500	2,600	4,200	8,223	9,562	10,823	14,062
Total	9,100	13,000	9,100	12,700	28,409	33,130	37,509	46,130
Ministry of Urban Affairs and Housing								
LCPC [Central Laboratory for Bridges & Roads]	16,700	21,500	11,000	15,800	42,439	51,249	59,139	72,749
CSTB [Scientific & Technical Center for Bldgs]	21,100	28,000	19,000	29,300	55,277	68,201	76,377	96,201
IGN [National Geographic Institute]	6,900	8,500	6,300	9,000	-	-	6,900	8,500
Incentives	37,500	48,000	34,700	51,700	24,063	27,960	61,563	75,960
Total	82,200	106,000	127,700	105,800	121,779	147,410	203,979	253,410
Ministry of Environment	29,300	38,000	28,300	14,000	0,779	0,875	30,079	38,875
Ministry of Maritime Affairs - Incentives	22,000	25,000	8,000	16,200	0,973	1,094	22,973	26,094
Total EIR [Interministerial Research Envelope]	1,019,940	1,332,600	1,048,640	1,203,500	1,040,030	1,235,584	2,059,970	2,568,184

R & D: FRANCE, FRG COOPERATION, FRG BUDGET OUTLINES

Paris AFP SCIENCES in French 5 Nov 81 pp 4-7

[Text] Paris. Promotion of Franco-German cooperation in research and technology.

Franco-German cooperation in research and technology will be strengthened and extended to new areas; the ministers responsible for research, Andreas von Bulow and Jean-Pierre Chevenement, confirmed this intention at a labor meeting in Paris 29 October.

The two ministers, who had already met in Bonn last 12 and 13 July, insisted on the fact that the industries of the two countries "will be able in the long term to have an impact on international competition" owing to close cooperation in recent technological developments, turning to profit "the opportunities they offer for the creation of new products."

"The close relations between France and the FRG constitute a top priority," Chevenement stressed. "The coordination of our efforts in certain areas of basic research is absolutely necessary, since the latter is so expensive," von Bulow declared for his part.

Here are some specific details concerning the main topics investigated by the two ministers of research during their meeting in Paris:

1) Improvement in cooperation, and in scientific and technological exchanges. Detailed cooperation in the policies for innovation and industrial development of the two countries will be undertaken. The study of prospects for Franco-German scientific audiovisual coproduction intended for the general public is pledged. The decision to award several prizes each year for Franco-German scientific cooperation was also made.

2) Space. Chevenement passed on to his German interlocutor the results of the limited council of 15 Oct 1981 on space.

The two ministers emphasized the interest they take in the development of European cooperation, especially in the European Space Agency, and agreed to cooperate in the Ariane 4 programs and in the development of orbital platforms.

3) Modern technology for the use of charcoal. The gasification of charcoal, stressed Chevenement and von Bulow, "opens up a very large potential field of cooperation between the two countries and is of prime interest for the future."

4) Nuclear programs. Franco-German cooperation is "essential for the two countries." The two ministers proceeded to an exchange of viewpoints on the respective programs of France and the FRG, and on cooperation especially with regard to reprocessing and breeder reactors.

5) Working conditions. The two ministers decided on the creation of a joint labor group to examine the possibility of cooperation with regard to the improvement of working conditions. The Detraz mission that takes care of this problem in France will shortly go to Germany. The FRG spends 120,000 DM per year in this area, whereas in France research fund expenses are at present only 20,000 Fr.

6) Oceanology and climatology. Several projects are being studied. It was reported that the opportunity of using French ships, submarines, and research devices will be offered to German researchers.

7) European affairs. Chevenement presented to his German colleague the French memorandum on European revival which includes an important chapter on research and innovation in Europe, from the point of view of the next EEC research ministers' council which will be held next Nov 9 in Brussels.

8) Major scientific equipment. Franco-German cooperation is already very significant in this respect (the Langevin-von Laue Institute, the Daisy accelerator in Hamburg, the millimetric wave radio telescope etc.). Means to strengthen this cooperation further, particularly by the reciprocal use of research installations in the two countries, will be studied.

9) Electronics. The two ministers agreed on the necessity of promoting European cooperation in this area, which is decisive for competition between Europe and the other major industrial countries, particularly in microelectronics.

10) Scientific and technical information. It was decided to promote very active cooperation in this area by reinforcing the links between the CNRS [National Center for Scientific Research], the MIDIST [Interministerial Mission on Scientific and Technical Information] and their German counterparts.

The 1982 Budget of the West German Ministry of Research and Technology (BMFT)

The federal government's draft budget for 1982 provides a subsidy of 6,536.4 billion DM to which must be added 280 million DM by way of supplementary assistance to other departments destined for micro-electronics, optic telecommunications and iron and steel metallurgy.

The increase of 460,000 DM, i.e., 7.6 percent of BMFT funds, only half compensates for the abatements effected the two preceding years in the medium term finance plan established in 1979.

The main features of the 1982 budget are the following:

1) Basic research, to which about 30 percent of the research budget is devoted, remains a first priority.

2) As far as realization structures are concerned, the major research centers receive 25 percent of the budget and are to be the object of measures designed to facilitate flexibility and the undertaking of new jobs, hence the reduction by 7.5 percent of their personnel expenses.

Major projects (KALKAR, Antarctic HTR, linear motor etc.)	3,561.900 DM
Research centers and installations	2,246.400 DM
International cooperation (ESA, Spacelab, AIEA)	680,100 DM
Operation of the administration and ministry	48,000 DM

3) At the sectorial level, priorities are:

--Energy, with a 40 percent share of the budget and 2,618 million DM. The overruns in the total cost of the SNR-300 KALKAR breeder reactor, estimated today as costing 5 million DM, necessitate a total grant from the electric companies of 1.4 million DM, that is to say, 300,000 DM for 1982.

--Space, with an increase of 10 percent, which will be curbed beginning in 1983. The financing of the Franco-German direct television satellite program necessitates a 180,000 DM grant from the Federal Ministry of Mail and Telecommunications, its future user and exploiter.

--Microelectronics and the new communications techniques which increase by 20 and 38 percent respectively, and will receive 140,000 and 76,000 DM.

--Biotechnology increases by 24 percent and reaches 83,000 DM.

Receiving a minimum increase:

--the health field.

--the improvement of working conditions.

Receiving a reduced allocation:

--transport.

The distribution of expected resources according to objectives and programs can be seen in the appendix.

BMFT'S 1982 BUDGET

Objective		Program	Financial resources DM (millions)	Percentage
Guarantee of material resources	1.	Research and techniques in the area of energy.	2618.7	40.1
	2.	Research and development in raw materials (H2O included) and materials.	242.5	3.7
	3.	Research and oceanological techniques, polar research.	213.8	3.3
Maintenance and/or improvement of industrial competitiveness	4.	Assistance for innovation	28.4	0.4
	5.	Physical techniques, production techniques.	78.0	1.2
	6.	Electronics.	140.0	2.1
	7.	Data processing.	52.0	0.8
	8.	Space research and technology, aeronautical research.	915.1	14.0
Improvement in living conditions	9.	Techniques relative to health, nutrition, and the environment.	470.0	7.2
	10.	Improvement in working conditions.	118.0	1.8
Modernization and upgrading of infrastructures and public services	11.	Transport technology, building research.	253.0	3.9
	12.	Communication technique, information technology.	131.0	2.0
	13.	Information-documentation.	85.3	1.3
Basic research	14.	Financing of diverse scientific activities.*	564.6	8.6
	15.	Physics-chemistry basic research.	578.1	8.8
Administrative expenses			48.0	0.7
		Total	6536.4	100.0

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*Not a part of other programs.

9824
CSO: 3102/84

BRIEFS

MINISTRY OF INDUSTRY BUDGET--Marked increases in the industry budget in 1982. The ministry of industry budget for 1982, which increases to 10.4 billion Fr in program authorizations and ordinary expenses (+50 percent compared with 1981), was adopted by the National Assembly last 15 November. In addition to these funds, the ministry of industry will have jurisdiction over open endowments, included in the Research and Technology budget, for the benefit of the five big organizations (CNES [National Center for Space Studies], AEC, COMES [Solar Energy Commission], ADI [Data Processing Agency], and INRIA [National Institute of Data Processing and Automation Research]). These funds will, in fact, be transferred at the beginning of 1982 to the Industry budget which guarantees their administrative and financial management. The sum total of program authorizations relative to industrial policies (2170 billion Fr) and ordinary expenses (88 billion Fr) increases to 2258 billion Fr (compared with 769 billion Fr in 1981). In addition, endowments for the benefit of the FDES [Economic and Social Development Fund] and other organizations will make it possible to free an additional 7 to 8 billion Fr for industrial policies. Out of the 2258 billion Fr, 986.91 billion Fr will be set aside for general allocations for industrial policies, 765 billion Fr will go towards the development of data processing industries and applications (as against 469 billion in 1981), so as to assist with the financing of projects related to small data processing, the SSCI's office automation, the development of automation and of CAO [Computer-aided Design], and to microelectronics, and 348 billion Fr will be assigned to the adaptation of industrial structures. Of the technological development policy resources (4395 billion Fr), 1816 billion Fr have been apportioned to AEC, 2145 billion Fr to CNES (+28 percent), 314 billion Fr to INRIA and ADI (data processing and automation), and the rest will go to chemistry and the other technological development programs. [Text] [Paris ELECTRONIQUE ACTUALITES in French 20 Nov 81 p 2] 9824

CSO: 3102/60

REPORT ON LAUNCHING OF JOINT FRENCH-ITALIAN ATR-42 PROJECT

Brussels LA LIBRE BELGIQUE in French 14/15 Nov 81 p 12

[Article by Pierre Sparaco: "France and Italy have launched a new 'regional' aircraft, the ATR-42. Sonaca perhaps a candidate for subcontract work."]

> [Excerpts] The launching of a new airliner is always something of an event, a fortiori if it is a European venture. A few days ago, Aerospatiale and Aeritalia decided to undertake the construction of a twin engine aircraft in the 40 seat category, the ATR-42 (42 seat Regional Transport Aircraft), of which the first models in the series will be ready for delivery by the end of 1985. It is a "first" in terms of Franco-Italian aeronautical relations, the more remarkable for the fact that the two partners opted for an equal distribution of investments. In principle, the door is open to associates or subcontractors who submit their applications quickly. Sonaca might be interested.

Taking into account what is in principle a very substantial potential market (perhaps nearly 3,000 units from now to the end of the century), 20 years after the first race to produce a successor to the DC-3, many design departments went back to work again. In France, for example, Aerospatiale first of all studied the AS-35 project (36 to 44 seats), while the Italian group, Aeritalia, badly in need of a civil cargo plan, undertook the study of the AIT-230 with the same clientele in mind. Soon, the two companies realized the similarity of their approach and joined forces to develop the ATR-42 project.

Since the initial investments to be taken into account amounted to about 1.2 billion Fr, this speculation required careful consideration even though it was appreciably less ambitious than, for example, the launching of a new member of the Airbus family. At the time of the Bourget exhibition of last June, the manager of Aerospatiale's aircraft division, Andre Etesse, indicated that the prospects looked good, especially in the United States; several companies had already placed orders for some 40 models.

From that moment therefore, the ATR-42 was virtually launched. The timetable announced at the Bourget exhibition has been actually observed and the project is

now under way, on the basis of about 60 orders and options. Equipped with two 2,200 hp Pratt and Whitney turbines together with four-bladed propellers, this new European airliner will carry 42 to 46 passengers at more than 500 km per hour, while consuming 45 percent less fuel, according to its promoters, than do older aircraft.

It is precisely Fokker that risks paying for this project, at least in the immediate future. Sacrificing the essential element of their resources to a much more ambitious project, the twin jet aircraft MDF-100 with 150 seats, which they are endeavoring to develop jointly with McDonnell Douglas, the Dutch manufacturers have only just mentioned the possibility of installing new engines in the F-27. Furthermore, the ATR-42 will not be the only one on the market. In Canada, De Havilland is working on a comparable Dash 8, while C.A.S.A. (Spain) and Nurtanio (Indonesia) are also working on a regional aircraft with the same capacity.

One Family?

The Franco-Italian enterprise is more ambitious than appears at first sight. One notes, for example, that the final assembly line will be set up in Toulouse, but that a second line is planned for Naples, for military versions. Moreover, two additional variant models are already planned, an ATR-42F equipped for freight transportation, and the ATR-42QC Quick Change (is that not a name registered by Boeing?) which can be rapidly adapted from a passenger setup to one for cargo.

In the long term, an ATR-XX is to see the light of day; it will be a longer aircraft, with greater capacity. It will doubtless constitute a first step towards 80 or 100 seat aircraft equipped with propellers of completely new design, in the Profan multiblade line being developed by the Hamilton Standard company in the United States. It is an option to be followed attentively, insofar as one thus already sees the outline of one of the short/medium range aircraft of the future, with the propeller snatching some of the jets' prerogatives, theirs for two decades, and all this because of the oil crisis.

Hardly spectacular, admittedly, the ATR-42 is perhaps assured, in this context, of a very brilliant future. On the other hand, it is surprising that Aerospatiale and Aeritalia have apparently foregone any association with an American partner, who would have facilitated access to one of the largest potential markets. On the other hand, and this no doubt explains all that, the Franco-Italian group has nonetheless already found American buyers.

In principle, at least, each of the two companies is willing to cede 10 percent of its share to other partners. With that in mind, Sonaca established contacts with Aerospatiale several months ago. If these are maintained at the theoretical level, the Charleroi company having informed us this week moreover that it is still interested, one may legitimately wonder how negotiations could be concluded satisfactorily within a sufficient brief span of time.

Sonaca's general director, Marcel Claisse, observed to us that it is difficult to maintain two investments simultaneously. A priori, it is advisable to leave the door open to Belgian participation in the A-320 Airbus. If the latter is in fact launched in the next few months, which is plausible, taking into account the

poverty of Belgian resources, the present new political interlude and the absence of sufficiently clear aeronautical rules of play, there is a good chance that the ATR-42 will be added, from the Belgian point of view, to the list of lost opportunities.

Nevertheless, although unable to claim a role as full partner with Aerospatiale and Aeritalia, Sonaca could still be included among the subcontractors in the Franco-Italian program. On condition, in any case, that they are in a position to come up with adequate financial resources and, above all, a level of competitiveness which compares favorably with other applicants. But clearly to take flight the ATR-42 will not wait for a possible Belgian contribution.

9824
CSO: 3102/69

AEROSPATIALE, AERITALIA ACCORD ON CONSTRUCTION OF ATR 42

Paris L'HUMANITE in French 9 Nov 81 p 3

[Text] The ATR 42, a true regional service aircraft. In presenting his budget to the deputies, Charles Fiterman informed them that an agreement had been reached on Saturday between the French company Aerospatiale and the Italian firm Aeritalia for the manufacture of the ATR 42 regional transport aircraft. The plane will be a twin turboprop (engines with turbines and propellers, consuming less fuel), in the 42-seater range, designed to land and take off on short runways (which reduces the importance of land acquisitions). It will be built by the two firms which will participate equally in the venture. The French minister of transport, Charles Fiterman, and the Italian minister of industry, Giovanni Marcora, expressed satisfaction with the agreement and, in a joint communique, their desire "that cooperation between the industries of the two countries, in the field of civil aeronautical construction, might extend to other projects of common interest."

The new ATR 42 Franco-Italian aircraft is to go into service by about the second half of 1985. It will be equipped with 42 to 49 seats (indeed, more than 60 seats in the elongated version) and will be suitable for flights from 370 km to 1,300 km. Its turbopropellers will be supplied by Pratt and Whitney of Canada. According to the studies of specialists, the civil world market for an aircraft of this type will amount to more than 3,700 aircraft over the next 20 years, and Aerospatiale and Aeritalia hope to capture nearly a quarter of this market and to sell up to 900 planes. It was mentioned at Aerospatiale that already, even before the decision to embark on the construction of the ATR 42, some 60 tentative orders had been placed. The assembly lines will be installed in Toulouse for the passenger version and in Italy for the cargo version (up to 4.7 metric tons of freight). Aerospatiale will be responsible for the general architecture, the construction of the wings, and the fitting out of the cockpit and cabin. Aeritalia will be responsible for the fuselage, the stabilizers and the landing gear. In France, the realization of this program will mean the creation of 4,300 jobs between now and 1988.

9824
CSO: 3102/60

'NEW-TECHNOLOGY-WING' PRODUCTION AT DORNIER

Stuttgart FLUG REVUE in German Dec 81 pp 42-43

[Article by Hellmut Penner: "Technology Wing--The Construction of the Advanced Airfoil of the New Do 228 Dornier Aircraft"]

> [Text] Age-old principles in combination with the most modern technology: Just as the dugout canoe is sculpted from a tree trunk, the wing of the new Dornier utility and commuter aircraft series Do 228 is milled from a single slab of aluminum. The advantages of this new wing construction technology have been fully recognized by foreign aircraft manufacturers, especially those in the United States.

There is a continuously increasing supply of products in the aircraft market worldwide. During the last few years even Third World countries like Spain, Israel and Brazil have tried their hand in the commuter aircraft business. This does not make it very easy for a country with the highest labor cost, such as the FRG, to remain competitive in aircraft construction.

Additionally, to enter a market which had been fairly well saturated previously would appear to be very daring indeed.

Nevertheless, Dornier decided to take this daring step, with the 228 utility and commuter airplane. On the world market, it is in direct competition with the Embraer EMB-110 from Brazil, the Canadian De Havilland of Canada DHC-6 Twin Otter, the British Shorts Skyvan, Australia's GAF Nomad N22B and the Spanish CASA C 212 Aviocar.

To obtain a nominal share of the market for this class of aircraft, it was necessary for Dornier to convert its experience gained with the multipurpose aircraft Do 27 and Do 28D Skyservant into a new, even more economical, generation of aircraft.

As we have previously reported (in FLAG REVUE August 81), the process is based on the well-proven unit construction system which was derived from the Skyservant fuselage. The Do 228 wing is a new development which holds promise for the future. Its better lift coefficient and improved L/D ratio not only make it more economical, but also make its production more cost effective because of the use of the most modern manufacturing processes.

The chief of Dornier's "New Wing Technology" (TNT) project, Dipl.-Ing. Wolfgang Haberland, provided some insight to FLUG REVUE on the reason for the firm's final decision to produce the Do 228 in series. In Haberland's opinion, such major aircraft manufacturers as Beech, De Havilland of Canada, Cessna, Piper or Swearingen are at present unable to interrupt production of successful models with new developments. The firms he listed have oriented their production toward large numbers of conventional aircraft models.

With a product mix consisting of almost 75 percent of military contracts, Dornier employs a large number of engineers who must be kept busy at all times. The Alpha Jet project, which served to accumulate a wealth of experience, has been most fruitful in that capabilities no longer needed for it can be fully used in the TNT/228 program. Because of its new finite element method and its computer assisted application, the same software is almost automatically usable.

NC machines which had been acquired for producing the Alpha Jet have, at the end of that series, a few capabilities available which can be used to good advantage in the Do 228 program.

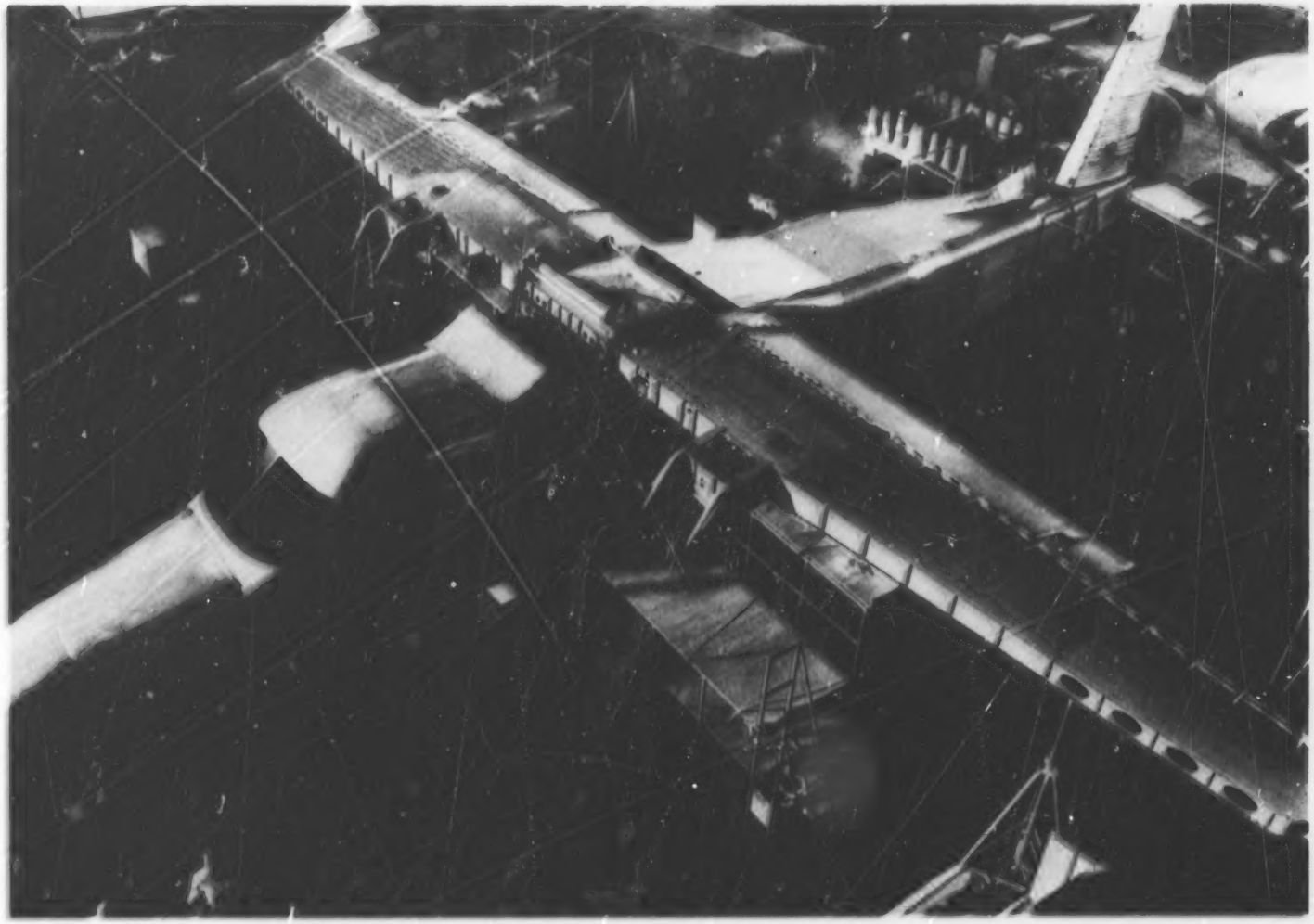
The central component of the Do 228 wing in both versions is the wing panel which until now had to be produced at great expense in a conventional manner. These panels, which carry the leading edge, the flap systems and the engine suspension mounts, had previously in all aircraft factories of the world been constructed in a very costly puzzle assembly of individual parts, including spars, ribs, stringers and skin. A chaotic jumble of side-by-side rivets provided the necessary tensile strength to the aerodynamic profile.

The result of this time consuming construction procedure is a great need for special tools which must be made by hand for every part under construction. In shop talk, this is known as preparatory work. It is obvious that skilled workers who do this type of work are highly paid.

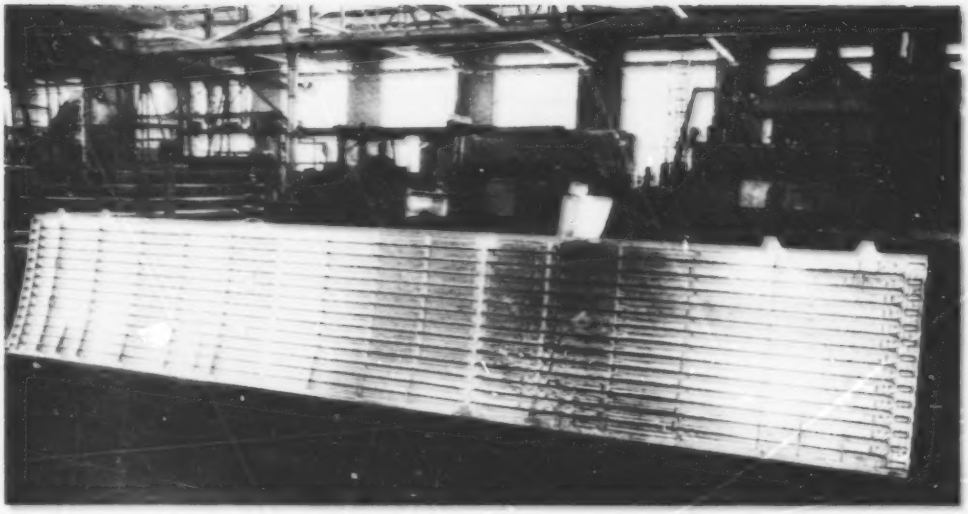
The picture is entirely different in at least some of the subsections of the Dornier plant. The panels for the new Do 228 project are milled from a single aluminum slab, whereby the longitudinal and transverse ribs, and spar flanges all form a part of the integral structure. Milling operations successively employ coarse, finishing and spherical cutters so as to obtain a structure resembling a casting as closely as possible already at the end of the milling operation.

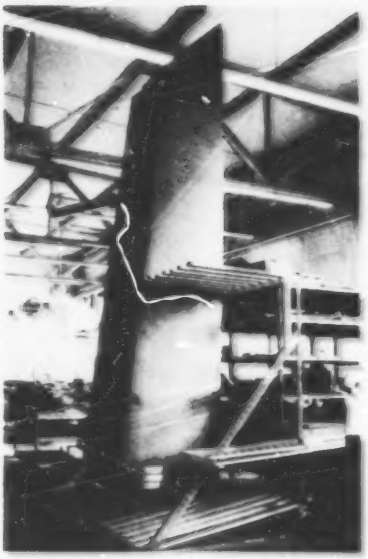
Tool relief is already provided for in the computer program. What is left is a skeleton with flange widths of 1.2-2.8 mm and base thicknesses measuring 1.2 mm. The aluminum slab milled in this manner is then given the desired aerodynamic profile with a computer controlled compression process newly developed by Dornier. In this process the rib flanges are compressed by movable hydraulic compression grippers. This compression or crushing procedure is performed with the help of a computer program and requires only one single skilled worker.

The compression points are at a distance of about 10 cm from one another. Any surface cracks caused by the milling process are eliminated by shot peening and subsequent slurry jetting. These are expedient procedures which had already



Conventional fuselage, wing of the future: assembly line production of Dornier's Do 228 utility and commuter aircraft.





[Top] The central part of the new Dornier wing: the center wing panel, milled by computer program from an aluminum slab.

[Below right] The outer wing panels, ready for attachment.

[Below left] The wing is taking shape--assembly of the Dornier 228 wing.

been used in Alpha Jet production. The two half shells thus produced are riveted together at the joint abutments. Total fabrication time is thereby reduced to 28-30 hours.

The upper surface of one of these half shells appears to have undergone a true spherical deformation. Actually, it consists of a polygon with the above described 10 cm intervals. The concavity, i.e., the deviation from the ideal profile, amounts to less than one-tenth of 1 millimeter.

Advantages of this procedure:

--a saving of up to 10 percent compared with rivet construction;
--lower weight;
--increased profile accuracy;
--production can be accomplished in three shifts;
--elimination of riveting cost;
--30 percent savings in production cost;
--life increase to 24,000 operating hours;
--immunity from salary increase costs.

The Dornier development department believes that the newly developed wing profile with its cited advantages becomes important only because the novel milling-compression procedure guarantees the requisite surface accuracy. In the meantime the new production technology has been recognized worldwide and especially by American aircraft manufacturers. Dornier is making efforts to engage in further marketing of the know-how it has gained.

9273
CSO: 3102/79

RENAULT 9: SIMPLIFIED ASSEMBLY, EXTENSIVE USE OF ROBOTS

Paris L'USINE NOUVELLE in French 26 Nov 81 pp 138-139

[Article by Michel Defaux: "Renault Facilitates the Work of its Robots"]

> [Text] Quality, productivity, less assembly time. The specifications for the latest car from Regie Renault were particularly exacting. Close collaboration between the research office and production services made it possible to simplify the Renault 9 and to use robotics more extensively.

"Close collaboration between the research office and the various services of industrial management solved by anticipation some difficult car assembly operations."

This statement by Josef Deudeurwaeder, director of the Douai plant, was made at the presentation of the Renault 9, and it gives a good example of the process that has led to the conception of a car that is simple and easy to assemble: from the beginning of the project, a close association was sought between production services and the people in charge of designing the product. "In addition to the normal planning work," Mr Ursault, chief of the R9 project, explains, "we have added factory methods, which has emphasized the simplicity of the product."

The R9 is Automated by Robot at 1,580 Points

This kind of organization has also made it possible for factory management to have a more important role in determining operations and output. The Douai plant was thus able to choose its own technical solutions. For reasons of productivity, quality and investment, the plant opted for the "all robot" solution as concerns floor assembly and chassis finishing. There are a total of 104 Acma-Cribier robots that spot-weld engine housings, front and rear frames, floorboard undergirdings, chassis finishings and that load and unload assembly lines, apply soundproofing undercoating, etc.

"To get the robot lines started, we took maintenance people and assembly methods that had been working on the R-14 robot lines," said Dominique Cousin, head of the Douai robot project. "The use of robotics at this level is very important. You can judge for yourself: on the R-14, which had 4,110 welding points, 3,200 were automated, and 280 by robots (5.45 percent of the total); on the R-18, in Flins in 1978, the robots did 10 percent of the automated points; today, on the latest Renault, 3,305 points are automated, 1,580 of these by robot for a proportion of 38 percent.

"The solution adopted has required an investment within 5-10 percent the same as that for multiple-point welders. But when there are other models to build, we can easily go over to another kind of production." In any case, the cost of the robots is unimportant relative to that of the whole production line (especially maintenance equipment): out of the 600 million francs spent on all the R-9's metalworking, robots account for only Fr 70 million, or a little more than 10 percent.

200 Robots Programmable to Manage the Unit

There are a lot of modifications over the latest existing automated lines. Thus, to go from one welding station to another, the Douai installations use a new means of transport (hydraulic motors linked to an electronic control unit) that is twice as fast as the conventional roller tables. To manage the unit, no fewer than 200 programmable robots have been installed. On the robotized lines, an SMC 500 connected at the conveyor level governs the transfer line, while an SMC 200 controls four robots at once. "Even on specific machines, we have gone from electromechanics to programmable automata. It's a technique that we had to get everyone to accept."

All welding torches are fixed, that is, they are opened only as much as necessary. This increases productivity and electrode life (less severe shocks), and it makes hard to reach places more accessible. Especially advanced studies have been made on arm-end equipment (a torch 800 mm long sufficiently light and resistant has been developed from techniques discovered in aeronautics to weld in the center of the tunnel). Finally, the robots are fitted with welding timers that control currents with precision and insure even quality. "With these robots," Dominique Cousin says, "we will convince the research offices that we can maintain quality control, that is, zero bad welds in class 1 and 0.2 percent in class 2. This can be accomplished. On future vehicles we can have 6-7 cm steps between two points instead of the 5-cm steps we have now."

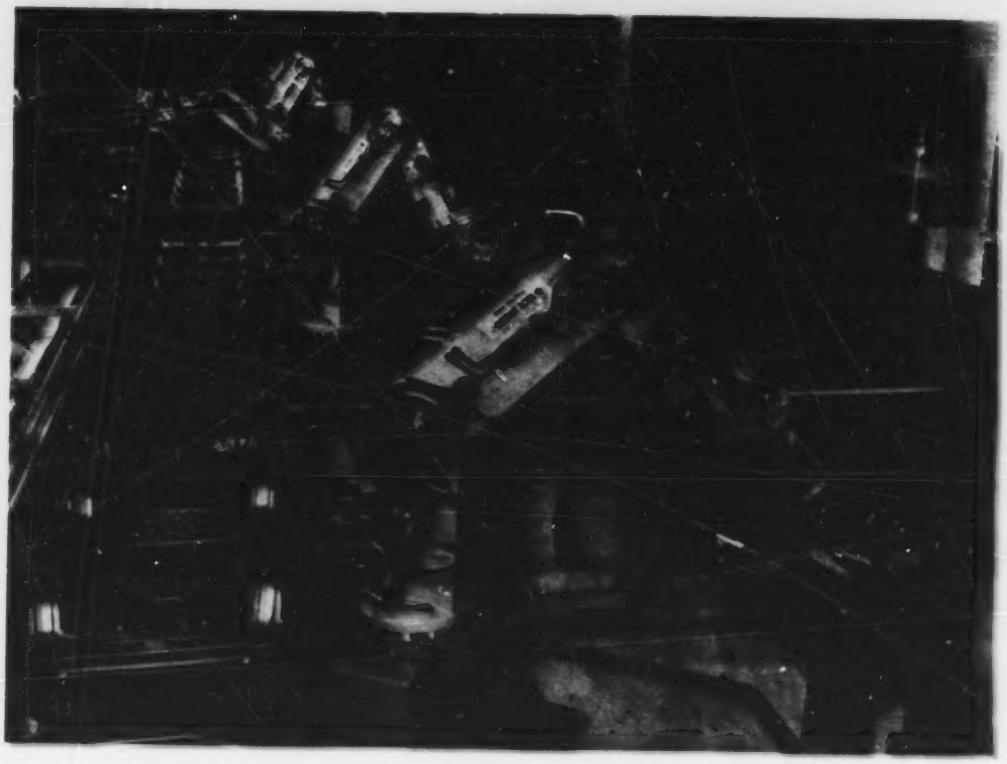
As for maintenance, production loss caused by robot breakdown must not exceed 0.5 percent. "When a breakdown occurs, you have 5 or 6 minutes to fix it. Any longer and you have to call in human operators. We are working on another solution that will have a second robot do the work of the one that is out of service."

Collaboration between the research office and factory has borne fruit in assembly, too. "That is where we spend most of our production time. We have kept assembly time within the amount allotted and we have even attempted to exceed goals. The object was to shorten the time spent on the assembly line." A good example: the assembly of the front wheel drive train is done on 120 cable-guided trucks moving through the plant. At each station, the engine housing receives in turn the motor, suspension, universal joints, brakes, shock absorbers, bars, springs, radiator, etc. Working conditions are better: you no longer have to work with your arms over your head or leaning over the fender. Quality is improved, too: hose connections and clamps are more accessible."

Before leaving this zone, the conveyor goes by the adjustment station. "All adjustments in the front end of the power train are done outside the car. This procedure has shortened assembly time by 10 percent." The frame and forward power train combination is then positioned under the body. Four automatic bolting machines then make the final assembly of motor housing and body.

Some pieces have been modified. "Thus, a multi-piece assembly (trim, name plate) has been replaced by a single, injected piece," Henri Bourgue explained. Mr Bourgue is head of factory industrialization, an outreach of the research office. Similarly, a change in design has led to discontinuing the rear power train alignment and to mechanizing the assembly process. Another example: the heating has been changed. "We asked the research office to consider monobloc technology, without cutting back on performance, of course. The work saved 50 percent of assembly time."

These steps will make assembly times very competitive with other products, even those from Japan. The object at the outset was to save 30 percent of assembly time, that is, to decrease it from 30 to 20 hours. The challenge has been met.



Spot-welding of engine housings: seven robots grasp the housings on the conveyor and place them under the welding machines.

Finishing of the R9 chassis. The gigs carrying the chassis have a magnetic label which allows the robots to recognize the type of vehicle to be welded. When the assembly line was put into operation, models R5 and R9 passed through the same line without any problems.

8792
CSO: 3102/77

EXPANSION OF HIGH-SPEED TRAIN NETWORK TO BE PROPOSED

Paris AFP SCIENCES in French 29 Oct 81 p 43

[Article: "Railways/High-Speed Trains/France"]

[Text] Nantes--Atlantic TGV [high-speed train] project: The Atlantic TGV project will be submitted for government approval before the end of 1981. If it is accepted, the TGV serving the Atlantic coast could go into service in 1988, according to a press release by Mr Guy Verrier, national director of new lines in the SNCF [French National Railways], in Nantes on 22 October.

The main station will be Paris-Montparnasse. Then, on the unused roadbed between Montrouge and Massy-Palaiseau, a "new TGV line," which will be the trunk line for the future Atlantic TGV, will be constructed as far as Voves, south of Paris, where it will fork towards Tours and Le Mans.

From Le Mans and Tours, the TGV will use already existing lines: first, towards Nantes, the first line to go into service; second, towards Rennes and the north of Brittany; third, from Tours to Bordeaux over present lines, since the TGV is compatible with present roadbeds.

Thus, Le Mans and Tours will be one hour from Paris (as opposed to 1:40 at present; Nantes and Rennes will be 2 hours from the capital (now 3:00); Bordeaux, 3 hours (now 3:50). Many other cities will be served by the Atlantic TGV: Laval, Angers, Poitiers, Angouleme, Quimper, Brest, etc.

The Atlantic TGV will thus accompany the decentralization of French regions and contribute, according to the SNCF, to restabilizing them by considerably improving service to the regions of Brittany, the Loire valley, Poitou-Charentes, Aquitaine, and the whole Atlantic coast, which contains more than 10 million people (20 percent of the population of France).

According to the SNCF, the rail traffic affected by the Atlantic TGV project includes about 19-20 million travelers divided about equally between the two axes of the west coast. The traffic should include nearly 25 million travelers when the project is completed.

Construction and conversion work on the infrastructure and superstructure could begin in 1983 if the government approves the project submitted by the SNCF.

8782
CSO: 3102/77

END

JPRS 79880

18 January 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 88

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JPRS 79880

18 January 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

No. 88

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ELECTRONICS

PHILIPS ANNOUNCES ITS FIRST C-MOS UNCOMMITTED CIRCUIT

Paris ELECTRONIQUES ACTUALITIES in French 20 Nov 81 p 14

[Text] On 17 November, Philips officially announced in London its first uncommitted C-MOS reference circuit, the PC 700. It is compatible with the C-MOS 4000 family and is relatively complex since it integrates 352 8-transistor cells (4 P-MOS and 4 N-MOS) and has 2 interconnection planes at the chip surface, a polycrystalline silicon, and an aluminum one. RTC [Radiotechnique Competec] will begin marketing this circuit in early 1982. RTC will be designing the circuits based on schematics and test sequences provided by the customer. Samples will be provided 12 to 20 weeks later. Important users will be able to have access to RTC's computerized tools and turn-around time will then be reduced to 7 to 10 weeks after completion of the mask-generation tape. According to RTC, the polycrystalline silicon channel concept used in this circuit would permit a utilization rate of up to 90 percent.

2000-Gate, 1 to 2 ns ISL [Integrated Schottky Logic] Circuits Are Being Prepared

The line of uncommitted digital circuits offered by RTC will therefore be quite complete since it will allow personnalization of circuits compatible with the three main basic logic families currently available: the 100K ECL family (HXA 220 and HXA 230), the TTL-LS family (8A ISL 1200, 1260, and 1542), and the 4000B C-MOS family (PC 700). Currently, Philips/Signetics' main effort is on the latter two families since they are the object of the greatest number of new orders. Thus, whereas a single 1144 gate 8A 1200 circuit was offered in the last 2 years in ISL technology, the family of these 4 ns/168mW gate circuits starts with the 8A 1260 circuit which is identical, except that it has 60 I/O's instead of 36, and with the 8A 1542 circuit which has 1500 gates and 42 I/O's. These two-interconnection-level circuits can call upon the same technology as standard TTL-LS circuits and they are available in a military spec temperature range. In parallel, Signetics is refining their LS technology. This work should result in 1 to 2 ns/2000-gate ISL circuits and about 100 I/O's before 1983. By then, a new 4 ns circuit should be offered. Let us note that the RTC Caen plant would be able to produce very fast ISL oxide-insulated circuits if the market requires.

A 3 to 9 MHz C-MOS Circuit

With uncommitted ECL and ISL circuits, the user is supposed to define the circuit personalization. In order to do this, he uses function libraries, a simulation program, and a test generation program. Automatic interconnection testing is carried out but, in the case of ISL circuits, the interconnection itself is still made with mylar.

The uncommitted C-MOS being announced today is a 700-gate model (2-input equivalent) with 38 I/O's implemented in a DIL module with 40 or 28 pins. Supplies are 3 to 15 volts and the minimum clock frequency is 3 MHz at 5 volts, 6 MHz at 10 volts, or 9 MHz at 15 volts. With a fan-out of 2, its propagation time for a typical gate is 20 ns at 5 V, 10 ns at 10 V, or 7 ns at 15 V. Power consumption is 1 mW at 10 V in the idle state and the operating temperature range is - 40°C to +85°C.

The PC 700 is organized as a network of gates rather than a network of cells. Philips has developed a library of 48 basic functions that it is practical to use in order to save design time. Design therefore consists in developing a logic diagram from these basic functions, and then doing the layout and interconnection using the two available levels. A logic simulation program makes the work easier, as does an automatic circuit interconnection program.

Finally, the mask generation tape is obtained automatically, as is verification and generation of the test tape. This work is currently carried out using in-house computers, but Philips is currently adapting its tools to IBM and VAX equipment.

In the case of a development effort carried out by RTC, the cost of the first sample will be around 80,000 to 150,000 francs. If development is done by the user, the cost drops to about 50,000 francs from the time of delivery of the mask generation tapes. Starting in early 1982, a complete family of uncommitted 500 and 1700 gate C-MOS circuits will be offered.

Three Pre-characterized Circuit Families

In parallel, RTC offers its customers pre-characterized integrated circuits (circuits designed on request from basic library functions, which speeds design and reduces costs) already available from Signetics in the US. Three TTL compatible families implementing various combinations of transistors for the basic gates are being offered. All are offered in civilian and military temperature ranges. In the case of these circuits, users perform their own logic simulation and do their own mask design using self adhesive masking material; but the company's computerized tools are available to them. In practice, RTC considers that this solution is advantageous the case of circuits having less than 500 gates. Beyond that point, the circuit density coefficient becomes similar or worse than in the case of uncommitted circuits. Nevertheless, it is technically possible to go up to 100 gates.

The first library, called EPL, uses elementary gate schematics similar to the TTL-LS in order to make up the basic functions. Noise immunity is 300 mV with a fan of 15 and the speed is 4.5 ns with a fan-out of 1 or 5.5 ns with a fan-out of 6 (5.5 ns and 7.5 ns respectively when power consumption is reduced to 2.6 mW per gate instead of 5.6 mW). Circuit density is on the order of 14 to 42 gates per mm^2. Currently, the library includes 80 basic functions plus 14 input cells, 22 internal cells, and 12 output cells (8 mA, 20 MA, and 80 mA).

The so-called STL library uses a Schottky IIL basic cell with open output collector and multiple input emitter. Its characteristics are very similar to the EPL cells, except that noise immunity is only 128 mV, with a fan-out of 6 and operation is specified only over the civilian temperature range for the normal family. The library currently includes 68 functions, plus 16 input interfaces, 8 output interfaces, 22 low consumption internal gates, and 22 high speed internal gates.

Finally, the so-called ISL library uses the same technology as the company's uncommitted ISL circuits. Its characteristics are quite different from the other two: Noise immunity is 70 mV only with a fan-out of 6; power supplies are 5 V and 1.5 V (instead of 5 V for the other families); circuit speeds are 6 ns with a fan-out of 1 and 2 ns with a fan-out of 6 power consumption of .3 mW only; possible circuit density of 26 to 78 gates/mm^2, which results in chip surfaces of 30 to 50 percent of those of the EPL chips. The library currently includes 99 functions plus 9 input cells, 30 internal cells, and 13 output cells (also 8 mA, 20 mA, and 80 mA). A similar library exists for C-MOS circuits (it is being used by Philips in particular to assemble its 4000B family, a standard function) but it is not currently being offered outside the Philips/RTC group.

6445
CSO: 3102/57

ELECTRONICS

PHILIPS DEVELOPS C-MOS NONVOLATILE MEMORY

Paris ELECTRONIQUES ACTUALITES in French Nov 81 p 12

[Text] Next December, Philips RTC [Radiotechnique Competec] is expected to market samples of its first nonvolatile MNOS cell C-MOS memory. The product is the 16-bit C-MOS nonvolatile PCB 1400 memory, compatible with the famous General Instruments ER 1400 MNOS memory. Memories compatible with the I^2C series bus and the standard 16 Kbits model 2816 to be introduced in 1982 will follow the RTC line. These memories will be produced in the group's Faselec plant in Zurich.

An Improved Version of the 1400 Memory

Coming more than 5 years after the ER 1400, it is only to be expected that the PCB 1400 presents many advantages over the latter. Some pins which were normally connected to ground in the ER 1400 are now handling additional functions such as chip selection, authorization of function, test, or regulated output. The ground voltage, Vss, of the first imission must be brought to 5 volts in the second, becoming a Vdd voltage. All the input and output levels of the PCB 1400 are between 0 and 5 volts. For instance, the input voltage, Vil, which is variable between -10V and -3V in the ER 1400 must be between o and 1 volt in the PCB 1400. The output voltage Vol, is now set at .4 volt with a current of 2 mA (-7 volts on a 1.5 M load in the ER 1400) and the Voh is 2.5 volts with a current of .5 mA. In short, power consumption is reduced from 8 mA to 2 mA.

Contrary to its predecessor, the PCB 1400 does not have a narrow clock frequency limitation: it can vary from continuous DC to 125 kHz (11.2 to 16.8 kHz in the ER 1400). Also, it has no fixed operating cycle ratio (pulse width from 3 μs to infinity). Finally, it is recommended to use a single 10 ms pulse only for write and erase. It is to be noted that data retention is guaranteed to be 10 years and can take more than 10,000 write/erase cycles.

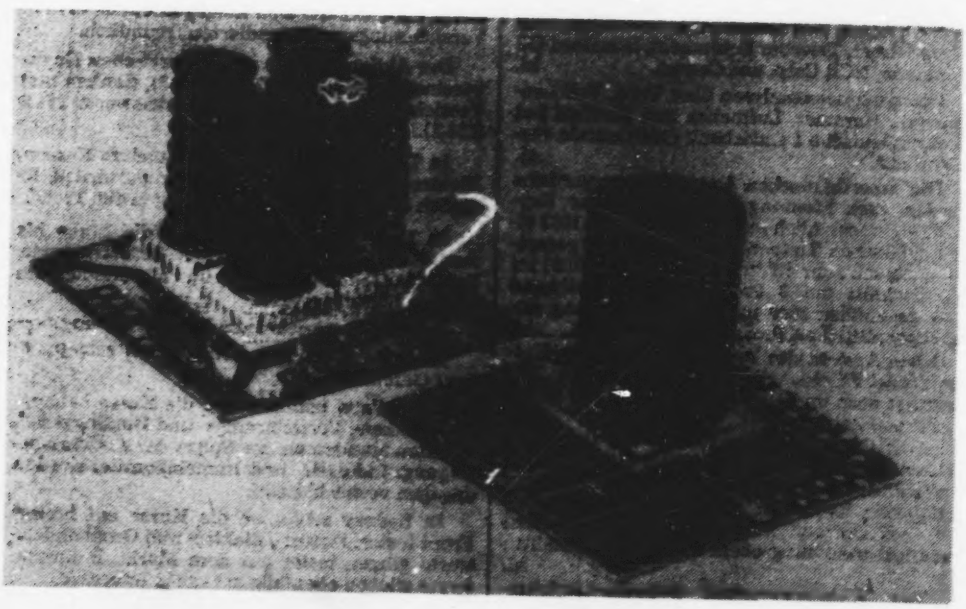
6445
CSO: 3102/57

ELECTRONICS

SIEMENS INTRODUCES CONCEPT OF COOLING TOWERS ON CHIPS

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 1 Dec 81 p 5

[Text]



Computer chips use very little energy when in operation. But a great part of it is converted into radiated heat. The more tightly the logic circuits are concentrated, the more dangerous their self-generated heat can become to them.

Siemens has therefore developed a new design in which small cooling towers on the components provide rapid heat dissipation. Together with a new type of horizontal ventilation, regulation of computers' internal temperature and the conditions for installation will be simplified considerably. Siemens is using this type of component in its new family of large computers.

9581
CSO: 3102/90

BRIEFS

UK, JAPAN ROBOTICS VENTURE--The British oil producer Sykes has signed an agreement with the Japanese robot company Dainichi to form a joint venture firm in the robot industry. According to plans the new company, which will be called Dainichi-Sykes Robotics, will be located near Leyland where Sykes already has a plant. According to a representative of Dainichi, the British will invest about 4.7 million pounds in the new company. According to the agreement the new company will produce Dainichi's robots for the entire European market. In the beginning, however, it will only market robots produced in Japan. Dainichi has a production capacity of 20 robots per month and is a medium-sized company by Japanese standards. The assortment includes seven different robots for arc and spot welding and assembly, among other things. [Text] [Sundbyberg MODERN ELEKTRONIK in Swedish 16 Oct 81 p 49] 9336

CSO: 3102/86

FRG, FRANCE: JOINT EFFORT TO DEVELOP MAGNETIC LEVITATION

Duesseldorf VDI NACHRICHTEN in German 13 Nov 81 p 1

[Article by Ralf Roman Rossberg: "Magnetic Levitation Development on Two Tracks Again"]

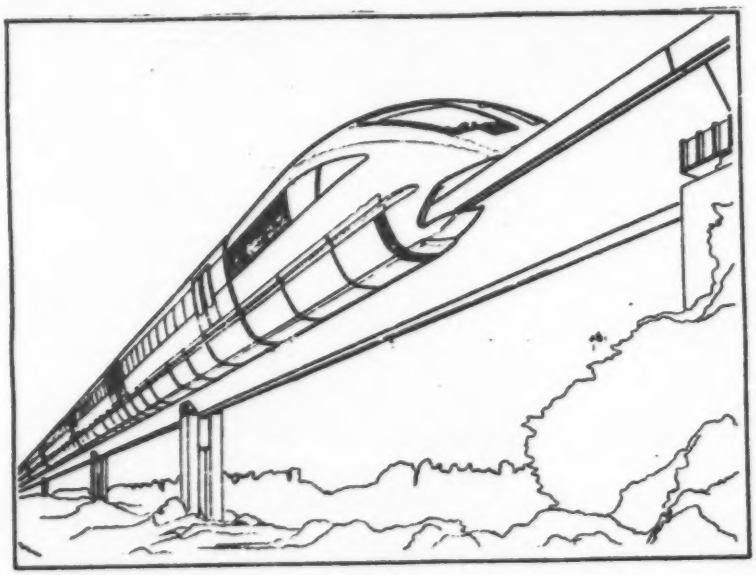
> [Text] While a test track of more than 30 kms is already under construction in Emsland and is almost ready for use, the current stage of development of an "interesting alternative" which is to be continued through Franco-German cooperation was shown as part of a bilateral presentation in Grenoble at the end of October. After 4 years, "money from Bonn" is again flowing into two developments, but for the time being the main emphasis will remain on the "Transrapid Project" in Emsland.

The decision of the Ministry for Research and Technology (BMFT) in 1977 to support only one version fundamentally affected the propulsion and guidance systems, which are the basic parts of magnetic levitation technology. In the systems competition, which has now been renewed, the object is the optimal form of propulsion. At the Emsland track a linear motor with an iron-bound stator is used to drive the magnetic levitation vehicle. In this technology, the active part of the linear motor is integrated into the track; all the energy for propulsion can be fed into a stationary system. The high cost of equipping the track and promising new developments in short-stator linear motors have resulted in the short-stator version being included in the studies again. In this version, the track has a passive reaction rail, the propulsion part of the linear motor is installed in the vehicle. Costs for equipping the track are reduced to between 30 and 40 percent of the long-stator version. However, the entire power unit must now be installed in the vehicle and energy has to be transmitted to it. A magnetic railroad using short-stator linear motors is given the best chance mainly in the speed range around 300 km/hour and with a lighter traffic load, long-stator propulsion is given better chances at high speeds around 500 km/hour and with heavy loads.

The Franco-German agreement is seen as another step on the way to the magnetic railroad. In this area it calls for the development of a contact-free, high-speed traffic system with a U-shaped short-stator linear motor and electromagnetic propulsion and guidance technology. The propulsion unit is being built by the French Celduc company in Sorbier, the propulsion and guidance technology

by Thyssen-Henschel in Kassel. The German company is also responsible for the vehicle design, safety equipment, the track and the application studies.

The core of a vehicle for the short-stator magnetic railroad is to be tested on a rotary test stand at the French Institute for Transportation Research (IRT) in Grenoble. It will consist of the propulsion and guidance system, which underwent further development in a different direction from the technology in Emsland, the appropriate control technology and the newly built short-stator linear motor from the Celduc company. A 12-meter diameter wheel simulates the track, at the circumference of which the U-shaped reaction rail is mounted. The guidance and propulsion module can then be mounted solidly on a frame above the wheel. This arrangement allows every possible disturbing influence to be studied.



This is how the partners in the Franco-German magnetic rail project envision the expected result of their development: Several nondriven cars to transport passengers or containers follow a short "driving unit" which contains the extensive onboard technology.

9581
CSO: 3102/90

TECHNICAL IMPROVEMENTS ON BMW PRODUCTS DESCRIBED

Turin ATA in Italian Sep 81 pp 528-534

[Article by J.P. Norbye: "Technical Progress at BMW"]

[Text] One of the few automobile industries whose products do not too obviously reflect the fact that the price of oil has quintupled since 1973, or the compelling need to reduce fuel consumption, is BMW (Bayerishce Motoren Werke, of Munich).

The firm's spokesmen stress that their automobiles were already light and efficient before the "oil crisis" and that further improvements have been made continually, in accordance with the principles and the philosophy of a firm that in 1980 produced 330,000 cars (as against 328,000 in 1979).

The technical director, Dr Karlheinz Radermacher, declares: "We have managed to reduce the average fuel consumption of the 1981 range by 10 percent as compared with the 1979 range. This has been possible also through the use of improved combustion chambers, the shortening of engine warmup times, adoption of the digital electronic installation and wider use of fuel injection. Greater fuel savings have been achieved by reduction of the aerodynamic resistance and the weight of our cars."

The fact remains, though, that BMW cars do not have a particularly aerodynamic profile and that BMW has not shown the same concern as regards weight as have other builders.

The aerodynamic coefficients of the 1981 BMW models vary from 0.39 (for series 7) to 0.445 (for series 3).

BMW recently completed construction of a wind tunnel, and Dr Radermacher expects the average car to have a Cx $\approx$ 0.32 in 1990.

What will the future buyer of a BMW be able to expect? The car will be much lighter, and the shapes of the future will concentrate on aerodynamic profiling. On the other hand, the dimensions should not change much. The relative position and dimensions of the driver-passenger compartment are nearly invariable.

The norms set by law (safety, etc) determine many other design factors which then influence both form and structure. The most notable changes in the future of the BMW concern the transmission. In about 3 years, BMW has achieved various interesting alternatives to the present engines and gearing.

The Eta Engine

The Eta is a high-compression engine running on super gasoline and optimized for keeping fuel consumption down. Production of it has already been decided on, and it will be available as an option in some 1982 BMW models.

BMW has named it the Eta, from the Greek letter used by technicians as a symbol for efficiency. The main purpose of the Eta concept has been to diminish the factors that act as parasites on the power produced by the traditional engine.

The basis of the Eta is the M-60 engine, with 80-mm diameter and stroke lengthened from 76.8 to 80 mm, with displacement increased from 2,316 cm^3 to 2,413 cm^3.

The standard cylinder head has been retained, with valves at 44° to one another, while new pistons have been installed that raise the compression ratio from 9.5:1 to 12-13:1.

In place of the K-Jetronic injection unit (mechanical, with continuous delivery) of the BMW 320i, the Eta engine has the Bosch L-Jetronic unit (electronic injection with air-mass dosage).

New cam profiles have been designed so as to obtain not so much high-speed performance charactersitics as torque at the lower speeds. Since internal friction losses increase as the square of shaft speed, BMW's technicians have worked out the characteristics of intake at the low speeds.

The torque curve has been flattened out, and the maximum value has been lowered from 4,000 to 3,000 RPM. Maximum torque has been increased by 15 percent to 220 Nm. The maximum power value has not been considered significant, provided that it is obtained at relatively low speeds.

The maximum-power engine speed has been reduced from 5,800 to 4,500 RPM, with a corresponding power drop from 105 kW to 90 kW. In the light of these modifications, it has been essential to adapt the gearing so as to obtain far longer total ratios.

According to BMW, the six-cylinder engine is the most suitable for such modifications, inasmuch as it is of appropriate unit displacement (402 cm^3), with combustion chamber more compact than is obtainable with a four-cylinder engine with similar displacement.

In addition, the four-cylinder engines tend to run rough under heavy load at low speeds, while the six-cylinder engines maintain their regularity down to the minimum.

BMW's technicians assert that it has been possible to reduce the losses from mechanical friction to below the level achieved by reducing rotation speed, as the result of a number of modifications that it has been possible to achieve by reduction of speed. The noise level also proves considerably reduced.

By carefully adapting the transmission ratios to the Eta engine, BMW has achieved a test prototype that has performance characteristics similar to those of the BMW 320i,

with the same behavior under acceleration and the same driving characteristics, with average fuel consumption comparable to that of a diesel engine--specifically, a 15-percent improvement over the BMW model 323i of 1981.

The TZA Engine

TZA (Teillast-Zylinder-Abschaltmotor [partial-load cylinder-cutoff engine]) is the acronym for the partial-load cylinder-cutoff system, which enables a six-cylinder engine to function on three cylinders when maximum power is not required. This involves the same principle as adopted by Cadillac for the V-8 engine, although the method is completely different.

While Cadillac uses an Eaton system that blocks the valves of the cylinders temporarily cut off, BMW simply interrupts the fuel supply to the preselected cylinders, letting them turn over with the throttle wide open. According to BMW, the Cadillac solution is more expensive and less efficient. The V-8 engine, being less elastic, cannot pass from eight-cylinder to four-cylinder functioning without going through the intermediate stage of six-cylinder functioning. In addition, this system is available only on Cadillacs with automatic transmission, not on those with manual.

The TZA engine is equipped with electronic fuel injection, which implies practically no additional cost for the device for automatically cutting off fuel to the three deactivated cylinders under low-power operating conditions. BMW has also subdivided the intake and exhaust manifolds in such a way that the three cylinders cut off take in the high-pressure exhaust gases coming from the three active cylinders. This provides considerable recovery power that minimizes the pumping losses due to the functioning of three cylinders that are empty, while the exhaust gases keep the inoperative cylinders hot, thus avoiding an increase in friction and wear.

The distribution does not necessitate any modifications. With the cutting-off of the fuel supply and injection of it into cylinders 1, 2 and 3, the engine turns in a regular manner with equidistant firing intervals in cylinders 4, 5 and 6.

In European urban driving conditions, the TZA makes possible a fuel reduction of 25 percent vis-a-vis the traditional engine, and about 20 percent in mixed driving.

Direct-Injection Turbo-Diesel

All diesel automobiles presently in production have indirect-injection engines--that is, with precombustion chambers (Mercedes-Benz) or high-turbulence chambers (Oldsmobile, VW, Peugeot, Fiat). With the combustion chambers in two parts, the combustion process proves less efficient, with greater dispersion of heat through the cylinder head.

Direct injection, in which the injector sprays directly against the piston, permits about 5 to 15 percent more fuel-saving than indirect injection. While its use is widespread on diesel truck engines, for which economy is of primary importance, direct injection has not yet been adopted on cars because of its noisiness and the problems of rough engine operation.

The BMW turbodiesel that will go into production around the middle of 1982 represents an innovation in diesel technology. The engine is ready to go into production already, but will be produced in a new plant still to be completed.

Like all other diesel engines for passenger cars, the BMW is of the four-stroke type. Nevertheless, the injection unit is more similar to that of the two-stroke "Detroit" diesel engines of GM than to those presently used on four-stroke direct-injection engines for truck applications.

In substitution for the central dosing or pressurization pump, an inexpensive delivery pump that feeds a number of injector groups (one per cylinder) has been adopted. Each injector provides autonomously for fuel-dosing, establishing the instant of injection, pressurizing the fuel charge, and injection in the form of a jet ready for fast atomization.

The charge is sprayed directly into the cylinder, without a precombustion chamber of any kind, and does not require the use of a heating plug for cold startup.

Combustion is relatively smooth, but that has not been sufficient for BMW, which requires noise levels far lower than those prescribed by law. The noise problem is indeed one of the main reasons why BMW called on outside specialists in the course of the designing of this engine.

Its choice went to an independent research institute, the AVL [expansion unknown] of Graz, Austria, which has been doing advanced research in the field of diesel-engine silencing for more than 25 years.

Noteworthy are the encapsulation techniques developed by the AVL, which consist in a very rigid internal structure enclosed in outer shells formed of compound curves (as is known, shaped panels transmit less noise than flat ones). On the BMW engine, all the noise channels are effectively blocked by insulation, from the manifolds and the tappet cover to the crankcase.

Even if the four-cylinder versions are produced for sale to other builders (Ford), BMW will adopt a six-cylinder in-line version with two cylinder dimensions for displacements of 2.5 and 3 liters.

The objective for the 3-liter was acceleration 10-percent higher than that of the five-cylinder Mercedes-Benz 300 SD Turbo, with consumption 10-percent lower.

Electronically Controlled Four-Speed Automatic Transmission

For several years BMW has been producing cars with longer final ratios and five-speed transmissions, so as to offer the expert driver the possibility of obtaining maximum performance characteristics, maximum economy or any compromise between them.

Moreover, BMW is not neglecting the sector of automatic transmissions, which could have an important role in the future. The problem with manual-shift cars is that there are drivers who, though expert and careful, do not know how to select the right gear at the right time for the purpose of obtaining maximum fuel-savings, especially when they want to use moderate performance characteristics. The car proves more efficient if gear-changing is done without the driver's intervention.

Several of BMW's most important markets require many automatic-transmission cars. For them, the objective is simply to reduce the transmission power losses.

BMW is studying these problems with a research project in which both ZF (Zahnradfabrik Friedrichshafen) and Bosch are collaborating--ZF for the transmission components and Bosch for the electronic part.

An experimental car was made available to me with ZF four-speed automatic transmission equipped with hydraulic torque converter with blocking device and with a four-ratio epicycloidal set with electronic speed-change command.

The blocking device stops the hydraulic flow of the torque converter whenever the mechanical unit proves capable of functioning without knocking, noisiness, irregularity of functioning or loss of efficiency.

Thanks to the electronic control of gear-changing, it becomes possible to select practically any curve of gear-changing points, with extraordinary precision. This approach permits great flexibility in adaptation of the gear-changing, and can be coupled to electronic engine controls (Motronic).

A switch on the dashboard makes it possible to select the gear-changing sequences for maximum fuel-saving, for maximum performance or for urban traffic. After selection of the sequence desired, the electronic unit goes into action, adopting the gear-changing points that correspond best to the driver's intentions. Appropriate electronic safety devices prevent selection of reverse at more than 8 km/hour and overrevolution during manual changes to lower gears at high speeds.

Various studies to optimize and lighten the transmission components are in progress.

Weight Reduction

According to Prog Joachim Elsholz, who is responsible for the body structures, the following possibilities exist for reducing the vehicle's mass:

--reduction of external dimensions while maintaining the same inside space;

--reduction of the dimensions of the materials--that is, new designing of details with use of the same material;

--use of materials of higher mechanical strength in order to reduce dimensions (thinner plates) and weight, with the mechanical strength of the individual components retained;

--combination of separate parts so as to obtain integrated individual organs.

Among the various solutions proposed by BMW's technicians, there is a window-opening device that weighs 1/10 of the one normally used and costs about one-third. The control uses a bidirectional cable instead of the geared mechanism. The control handle has been lightened by 15 percent, by reducing the thickness of the metal at the points of low stress and adopting a hollow section.

By means of stress analysis, a seat back has been optimized by modifying its contours and putting holes in the low-stress zones; the end result is a 10-percent weight reduction and an increase in strength.

Nevertheless, the possibilities of weight reduction by means of such simple systems are very limited, and largely exhausted already. If it is desired to achieve fur-

ther savings, new methods will have to be adopted, such as the finite-elements method, for example, though it has to be kept in mind that the weight-reduction thus achieved could create new problems in other fields (noise, etc).

Since about 80 percent of a car's mass is composed of iron and steel, it is logical to think that weight could be reduced considerably by the use of lighter metals and plastic materials. However, according to Prof Elsholz, the new types of steel with higher mechanical strength and cost not much higher are more promising.

With use of them, all the metal components whose mechanical strength depends on their dimensions can be made with thinner and therefore lighter sections. An important consideration in this regard is that because of the greater strength and higher yielding point of these materials, the other characteristics can be improved too. For example, an engine mount made of steel with a yielding load double that of type St 14 steel can absorb 30-percent more energy during plastic deformation than can St-14 steel.

Similar improvements can be obtained for body plating. With the use of stronger materials it is possible to reduce the thickness of the plate while maintaining or even improving the strength characteristics of the detail parts in question.

In this case, there is the fact that the thin plate costs more.

Prof Elsholz concludes by saying that for all the structural components of the driver-passenger compartment, and therefore for the plate elements that are essential for its mechanical strength, plate will be used that has a yielding load about double that of the steels presently used. The same holds true for the longitudinal structures that must absorb large quantities of energy in case of collision. For the outside covering of the vehicle, a plate will be used that has a considerably higher yielding load, so as to minimize plastic deformations even though smaller thicknesses are used.

BMW is presently reconsidering its own design criteria in various fields. The various covers on the body (hood, trunk lid, sun roof) are presently composed of two shells of plate: the inside one gives the necessary flexion and torsion rigidity and acts as a support for the outside one, preventing vibration of it and making deformation of it difficult. Both purposes can be fulfilled better by adoption of a "sandwich" structure composed of two steel or aluminum panels close to one another and with an expansion layer between them--a solution that offers optimal rigidity in all stress modes.

A further stage of development is that of producing the panel itself in sandwich form before assembly. A sheet of polypropylene or polyamide 0.8 mm thick is placed between sheets of aluminum or steel 0.2-0.3 mm thick. The resultant material can be formed like an ordinary steel plate, with the difference that it weighs about half.

It is also possible that such compound material can cost less than full aluminum plate. Nevertheless, the problem of the repairability characteristics of these materials remains; a great deal of development work is still needed for this problem.

Maintenance-Interval Indicators

For some years, BMW has been interested in the development of electronic systems for providing the driver with information of various types. The engineer Flohr has developed a study that could help to reduce maintenance costs.

Despite the improvements in the last 30 years as regards lubrification and the materials used for the engine and for the chassis, maintenance remains unchanged in a way; indeed, today as in the past, the maintenance intervals are expressed in terms of kilometers run. BMW does not believe that this is a valid criterion, inasmuch as the operating conditions have greater influence on the need for maintenance than does the distance run. The lifetime of the spark plugs, the oil-change interval, etc, can be far greater for long-distance usage than for urban traffic with its frequent stops and starts.

Wear and the levels of thermal stress are far lower in normal driving conditions than in fast driving, which is characterized by sharp accelerations, high speeds and abrupt braking.

To indicate the way the car is really lasting and the need for maintenance, BMW is testing a maintenance-interval indicator. The device is controlled by an electronic minicomputer that receives the data relative to engine running speed, distance traveled, temperature of engine oil, and the time factor. The instrument is composed of an illuminated panel with the legend "Check and change oil," as well as a group of five green-light diodes, one yellow, and three red.

As soon as the ignition switch is turned on, a maximum of five green lights go on; the number of lights lit indicates the period before the next maintenance is due.

When the engine starts up, the green lights go out. If the car needs maintenance, the yellow light stays lit coninuously. If the maintenance time has gone by, the red lights go on. The same thing happens for the annual check that is integrated into the system. When the maintenance has been done, the shop mechanic turns off the lights through the diagnosis plug.

The minicomputer has a memory and an auxiliary battery, so that if the main battery is disconnected, the data in the memory are not erased.

11267
CSO: 3102/93

ALCOHOL FUELS: NO TO SUGAR BEETS, YES TO GRAINS

Stockholm NY TEKNIK in Swedish 29 Oct 81 p 3

[Article by Norbert Andersson]

[Text] Sweden will not invest heavily in ethanol as an automobile fuel in the foreseeable future.

The Sockerbolaget sugar company has given up plans to convert the Karpalund refinery outside Kristianstad to a distillery and the pilot plant for ethanol production in Arlov has been shut down.

Just 1 year ago the thinking was completely different. Beginning in 1983, Karpalund was to produce 90,000 m^3 ethanol annually and before the end of the 1980's Sweden was to produce 400,000 m^3 annually as a gasoline additive.

The ethanol study supported the project and the agriculture minister was enthusiastic.

Energy Proposal Eliminated Market

Last fall, however, the energy proposal eliminated the market for ethanol in one fell swoop. The government proposed that instead of a mixture of methanol or ethanol with gasoline, the main direction should be toward cars that utilize 100 percent methanol as fuel.

Now Sockerbolaget has closed its pilot plant in Arlov and plans to utilize surplus sugar beets to produce automobile fuel have been abandoned.

"The ethanol project is apparently over for us," said Guno Haska, research chief at Sockerbolaget.

"We cannot convert Karpalund without state subsidies. We have already invested several million in experimentation and we cannot pump additional millions into the project if the ethanol market is not guaranteed."

No Loan to Sockerbolaget

Sockerbolaget has made several applications for funds. The Board for Energy Production Research (NE) has said no. In a few weeks the Oil Replacement Fund will also reach a decision, but Guno Haska is sure that the answer again will be no.

This will probably be the death blow to the Karpalund refinery. Conversion to a distillery was almost a prerequisite for the survival of the refinery.

As recently as last year ethanol was seen as the primary alternative to methanol as a gasoline additive.

Methanol is produced primarily from natural gas and it is imported. Because of the sharp price increases in oil several years ago, the Swedish trade balance shifted to a large deficit.

Domestic Fuels Against Deficit

The deficit would be reduced if we replaced some of the imported fuels with domestic fuels. Ethanol is produced primarily from agricultural products, of which Sweden has a surplus. In addition, protein-rich animal fodder is produced as a by-product. We presently import this fodder.

The primary advantages of ethanol are its high energy content and low toxicity and the fact that it does not separate into phases and does not adversely affect the trade balance.

The great disadvantage of ethanol is its relatively high price, up to 2.50 kronor per liter. In terms of energy content, it is twice as expensive as methanol produced from natural gas.

Pilot Plant Receives Funds

Alfa-Laval and Lantmannen are requesting an additional 5 million from the state to construct an ethanol plant in Lidkoping. They are seeking exemption from interest and deferred repayment of loans already granted by the government.

Previously the government promised 30 million kronor in subsidies and loans to the project.

In addition, Alfa-Laval and Lantmannen expect the 8.8 million kronor loan to be remitted after several years, unless the project yields unanticipated profits.

The Oil Replacement Fund will make its decision in early November. If exemption from interest and deferred repayment are not granted, the project probably will be canceled.

"We are expecting a positive answer, however," said Goran Wadmark of Lantmannen and Alfa-Laval has begun planning the project.

Cheaper Method

The so-called Skaraborg project is based on a method developed by Alfa-Laval (see NY TEKNIK, 1980:17). Eventually it could be much cheaper than the process Sockerbolaget planned for Karpalund and Alfa-Laval is dreaming of important export markets, including the United States.

The Lidkoping plant will produce only 600 m^3 ethanol per year. That is a small fraction of what Sockerbolaget had planned for its Karpalund factory.

However, the main purpose of the Skaraborg project is not to produce large quantities of alcohol, but to test the entire process from raw materials to finished ethanol and fodder products.

It could be called a combined experimental and reference facility.

Yeast Fungi Produce

Ethanol is produced by yeast fungi which use the starch in grain. The process runs continuously and uses less water than the Sockerbolaget method. For this reason, less energy is used to evaporate the water from the mash and to dry the residual products.

It is possible to produce 1 liter ethanol and 2 kg concentrated fodder from 3.5 kg grain.

Oljekonsumenterna (OK) has promised to handle the alcohol produced in this way. Lantmannen, which is participating in the project, is also a part owner of OK.

OK has not yet decided how it will use the alcohol. Previously, a blend of up to 10 percent in low-octane gasoline was discussed, but now a lower mixture, about 2 percent, is being considered.

This is similar to the normal amount of carburetor alcohol used in the winter, although it does not increase appreciably the octane rating.

9336
CSO: 3102/86

END

JPRS 80022

3 February 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 89

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JPRS 80022

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ELECTRONICS

RIFA PROVIDES HIGH-TECHNOLOGY USER-ADAPTED CIRCUITS

Stockholm NY TEKNIK in Swedish 12 Nov 81 p 56

[Article by Ulla Karlsson]

> [Text] By international standards, Sweden has a small semiconductor industry, but by avoiding the production of standard circuits this industry has done well, nevertheless. By 1985 the three Swedish manufacturers Rifa, Asea-Hafo, and Saab-Scania's microelectronics division hope to have an annual growth between 20 and 30 percent. This year sales will amount to about 450 million.

The largest semiconductor factory in northern Europe is in Kista outside Stockholm. The factory employs 950 workers. The company is Rifa, a totally Swedish semiconductor manufacturer. Rifa develops electronic circuits that are of great importance in the more and more rapid computerization process.

Rifa, Radio Industrins Fabriks AB, was formed in 1942 by several Swedish companies to guarantee the country's supply of components during the war. One year after the war ended the company was bought by LM Ericsson (LME) and Asea. Asea backed out 1 year later, however. Since then, Rifa has been a wholly owned subsidiary of LME.

Rifa, like other Swedish semiconductor companies, has chosen to produce user-adapted circuits. This is an area well suited to Sweden. In the production of user-adapted circuits it is not necessary, as it is in the production of memories, to have available the latest technology. It is more of an advantage to be a step behind and learn from the mistakes of others. It is also an advantage to be located as near the customer as possible.

The production of user-adapted circuits is also a field that is growing throughout the world.

Suits Telephony

Today Rifa is concentrating on integrated circuits. Up to this year the company worked only with so-called bipolar technology. This technology provides circuits that are faster and able to withstand higher voltages than those produced by the MOS technology which predominates today. (MOS technology means very simply that the building blocks of integrated circuits--transistors--are made of three layers of materials--metal, oxide, and a semiconducting material. The semiconducting material most often is silicon.)

Rifa chose to manufacture bipolar circuits because the properties of these circuits are needed in telephony. LME purchases 37 percent of Rifa's production, as well. This is also because LME does not dare commission other companies to produce components. Such commissions often reveal much about a company's knowledge.

With bipolar circuits, both analog and digital circuit functions are manufactured on the same chip. This is something only a few companies in the world are able to do. Rifa simply has specialized in interfaces betwee digitai parts of a system and their often analog surroundings.

Investment in MOS

Now, however, the LME management has discovered that Rifa must also be capable of producing MOS circuits. For this reason, LME is investing 30 million kronor in a semiconductor laboratory for MOS circuits. The technology, which was imported from the United States, is the very latest in the commercial production of MOS circuits (line widths of 315 microns). The laboratory is the most modern of its type in Europe. Last summer engineers also successfully produced the company's first memory (4 K N-MOS).

Rifa's investment in MOS technology also means that the company has entered a field where previously Asea-Hafo was alone. Rifa has chosen the new C-MOS silicon gate technology, whereas Asea-Hafo uses the older, more well known C-MOS metal gate. Asea also utilizes the more sophisticated and expensive SOS (silicon on sapphire) technology.

Hybrid Circuits

Rifa also has a division for producing hybrid circuits. These are circuits in which the conductive pattern, and sometimes resistors and capacitors, are made of a thin film. The active circuits--circuits that process signals in some way, for example amplify them--are then attached to the circuit. Most often these are integrated circuits. Engineers in the hybrid division now are conducting intensive research on a new ceramic packing method--the chip carrier (see NY TEKNIK 1981:29). This is a technology that Saab-Scania, the smallest microelectronics manufacturer in Sweden from a sales standpoint, has been alone in utilizing thus far.

The management of Rifa is also considering about 40 new products.

These include components made of gallium arsenide, a semiconductor material that is at least 5 times faster than silicon. Thus, gallium arsenide can be used to produce extremely fast circuits.

Rifa is investing heavily in the future. In the past 5 years 400 million kronor has been invested in buildings and equipment. During the next few years investments are estimated at about 50 million kronor per year, which may be compared to estimated sales of 350 million kronor annually.

Up to now LM Ericsson has contributed to the investments. Among other things, LME has invested 20 million kronor to construct a design center for high-technology integrated circuits at Rifa. Beginning this year, however, Rifa's managing director Stig Larsson believes that further investments can be financed with the company's own funds.

Rifa's sales in 1981 are estimated at 350 million kronor. The management of the company estimates that by 1985 this figure will have doubled.

9336
CSO: 3102/88

ELECTRONICS

STATE-OWNED MICROELECTRONICS FIRM BUILDS NEW FACILITY

Stockholm NY TEKNIK in Swedish 12 Nov 81 p 48

[Article by Erik Mellgren]

[Text] The grey glass facade is divided by thin aluminum window bars. The roof of the factory lies above lattice girders of blue painted steel pipes. It is all supported by stays from a number of poles along the middle of the building.

Here in Newport in southern Wales, the state-owned Inmos semiconductor company is building its new plant, one of the most important investments in the field of microelectronics in Great Britain. I walk around in the half-finished factory. Floodlights illuminate the naked concrete floor. Dick Selwood of Inmos points out various details and explains how this construction method provides a large free area. He shows how all service work and changes in the electrical wiring can be done from certain service passageways without intruding into the "clean room," the heart of the factory.

Glass and Iron

In the clean room, where the air is filtered extremely carefully, where the employees wear masks and special protective clothing, silicon plates will be converted into integrated circuits, a process with about 50 stages requiring several days for each plate.

"It will be clear from the outside that we have a highly developed technological process," Dick Selwood said.

"American semiconductor companies have such nondescript building that they could just as well be banks."

In one way the building is part of an old British tradition of building with glass and iron. Crystal Palace was constructed in this way in the late 19th century when British industry led the rest of the world.

The Inmos plant is an attempt to regain that position in the field of microelectronics.

50 Million Pounds

It was the former Labor government that decided to invest 50 million pounds in Inmos. At the same time a software company, Insac, and a company that sells word processing equipment, Nexos, were formed.

Three persons now in management positions in the company, including managing director Richard Petritz, are co-founders and minority stockholders in the company. Previously Petritz was head of the Texas Instruments research and development laboratory. In 1969 he founded the successful Mostek semiconductor company.

Inmos has its headquarters in Bristol, several miles east of Newport on the English side of the Severn River. There are also facilities for process development and production in Colorado Springs in the United States.

Out on the Market

Inmos's first products are already out on the market. They are memory circuits (16 K static RAM).

The Inmos memories are manufactured by a less complicated technique than those of competitors. Despite this, they are the fastest memories on the market, which is explained by their better "architecture."

This may be a result of the British influence--Great Britain historically has had advanced research precisely in the area of computer architecture, although this research seldom has been converted into commercial success.

In the beginning Inmos goal was to become one of the first companies to produce 256 K memory circuits. It will be several years before this can be accomplished, according to company spokesmen.

The company is now distributing samples of its new 64 K memory. Volume production of these will begin "as soon as possible," according to Philip Mattos, an Inmos technician.

The present version has a cycle time of 150 nanoseconds, an even faster one will come out around the first of next year, and in February or March an additional version with a cycle time of 100 nanoseconds will be produced.

Microcomputers

Another goal was to create an integrated microcomputer circuit that would be superior to present microcomputers. Today the company refuses to divulge any information at all on this development.

"The microcomputer is coming, but we cannot say when at present and we do not wish to divulge any information before the development work is complete."

Start in Newport in 1982

Production in Newport will begin during 1982. First the process will be developed in Colorado Springs. Inmos has opted for the most advanced production equipment presently available.

The location in Newport is the result of pressure from above. The Inmos management would rather have the factory in Bristol, but southern Wales is a "support area."

According to the agreement between Inmos and the Labor government the state subsidies were to be paid in two installments of 25 million pounds each. Only after the company agreed to construct the new plant in Newport did the new Conservative government give the go-ahead for payment of the second installment.

The factory and production equipment will cost about 30 million pounds.

9336
CSO: 3102/88

190 MILLION FRANCS IN NEXT FIVE YEARS FOR VLSI RESEARCH

Paris ELECTRONIQUE ACTUALITES in French 13 Nov 81 pp 1, 12

[Article by J.-P. Della Mussia]

[Text] Grenoble--The LETI [Electronics and Informatics Technology Laboratory (of the AEC [Atomic Energy Commission])] now awaits only the green light from its oversight agency, the AEC, and from the different administration bodies concerned with the adoption of a new VLSI [Very-Large-Scale Integration] plan, to begin major work on the Grenoble site. The different technological installations, which until now have been spread out over the site, must now be regrouped according to the orientation of their activities, and, above all, a building must now be erected devoted entirely to microelectronics.

At the same time, the permanent staff of the laboratory must be considerably increased, going from 450 persons in 1981 to 620 persons in 1986, the largest increase being that of the components research sector (from 230 persons to 370 persons). In microelectronics, the aim of the plan is to prepare the way for the 1990 generation of sub-micron integrated circuits. LETI officials are hopeful that ground will be broken for the new buildings by the beginning of 1982. Planned investments over the period 1982-1986 total Fr190 million.

A Return to Its Original Orientation

For the past several years, the LETI has made a distinct effort to gradually transfer its applied research teams to industry, the largest such movement having been to EFCIS [Research and Manufacture of Integrated Circuits]. This is quite normal and shows that its applied research efforts have proven worthy of concrete furtherance. But the laboratory feels it is time now to take the lead in regard to industrial developmental effort and to return to its original orientation: Research aimed at innovative industrial methods rather than mere industrial handholding. Thus, a plan has been drawn up and priorities defined for the period 1982-1986. The extent of these priorities is measurable by its staff increases and its investments in new buildings. As regards staffing, current materials activities employ 80 persons (18 percent), system activities 140 persons (31 percent), and components activities 230 persons (51 percent). The plan provides for an increase to 90 persons (14 percent) on equipment, to 160 persons (26 percent) on systems, and to 370 persons (60 percent) on components. Of the latter, microelectronics will get the lion's share with 160 persons in 1986, compared with

80 persons in 1981. As regards buildings, the plan calls in particular for the construction of a microelectronics laboratory with 6,000 square meters of floor space, 1,500 square meters of which will be clean rooms. It will contain the teams working silicon integrated circuits, bubble memories, Josephson-effect devices, and ordinary submicronic techniques, as well as the mask and CAO [computer-aided operation] services. Later, the teams working on so-called "in-out" components (sensors, display electronics, microsystem electronics) will join them, thus bringing together the entire components sector. Eventually, by 1986, the plan calls for bringing together on the same site all the teams of the "materials" sector, which are now very widely scattered.

Circuits Containing 10 Million Components

In the cycle that begins with basic research (the work of researchers like those of the CNRS [National Center for Scientific Research], the AEC, and, specifically, the CNET [National Center for Telecommunications Studies]) and culminates in industrial mass production, the LETI positions itself at about the halfway point, with, as we have seen, an orientation toward applied research and the transfer of know-how to industry. Thus, in the field of microelectronics, which is to be the object of heavy investments, the LETI works in close cooperation on basic research with the CNRS, within the framework of a group called the GCIS [expansion unknown], and with the the CNET Grenoble (CNE [expansion unknown]) Downstream, LETI's know-how flows toward the experimental pilot network of the EFCIS, a company in which the AEC holds a 30-percent share.

Under the new plan wherein the LETI is to "take a detached orientation," it will engage in research on integrated circuits that 5 years hence will be found on the industrial pilot network, and 10 years hence on industrial production lines. Studies must therefore start now on submicronic circuits that will group 10 million components on a single chip to assure French IC's of a good technological position in the market of the 1990's. The LETI will beef up its studies on materials flaws (the importance of which increases with the reduction of the geometries of components and which directly condition manufacturing yields); on materials-doping techniques by ionic implantation (owing to their ease of use, and to the homogeneity and reproducibility of the results obtained), possibly with simultaneous annealing; on masking (to develop the specificity of application of the three known techniques using visible light, electrons and X-rays); on etching; and on the designing of devices (throwing into the equation physical phenomena with the threefold aim of better understanding the operation of devices, of orienting the definition of a technology or the designing of circuits, and of developing CAO tools).

LETI-CNET: A Dual Purpose Step

There has been no lack of carpers during the past several months in the Grenoble region engaged in underscoring the fact that the two state organizations, the CEA/LETI and the CNET/CNS were carrying similar research simultaneously and in the same field of silicon integrated circuits. Officials of the two organizations

met recently to lay out a program that will be not only noncompetitive but also complementary with respect to research. As it turns out, even together, these two organizations could not possibly succeed in covering the entire field.

Their organization will make it possible to address different aspects of problems. The LETI is organized horizontally, with activities in the sensor/display and systems sectors. The CNET, on the other hand, works in nothing other than silicon integrated circuits, including the related research and pre-industrial development (which the LETI does not do). A memorandum of agreement has been signed between the two organization to avoid repeating the duplication of applied research efforts that could have been carried on jointly.

We have dwelt here mainly on the LETI's microelectronics activities, but its in-out components activities will also be the object of priorities as well as that of microelectronics equipment. Thus, in components, the LETI will intensify its work on thin-layer sensors, liquid-crystal displays for applications in telematics (with possible further extensions), and on microsystem electronics. As regards bubble memories, research will center on materials for the making of models with a capacity in excess of 4 megabits.

9238
CSO: 3102/68

SYNTHETIC NATURAL GAS PRODUCED IN COAL GASIFICATION METHOD

Duesseldorf VDI NACHRICHTEN in German 23 Oct 81 p 22

[Article: "Synthetic Natural Gas From Coal. A New Methanation Process Coupled With Coal Gasification"]

[Text] Synthetic natural gas produced from coal can make a much greater contribution to the public energy supply if the development of energy prices--especially the price difference between coal on the one hand and oil and gas on the other hand--provides the economic conditions for it.

Obtaining synthetic natural gas from hard coal has moved one step forward. In Oberhausen-Holten gasification of coal and methanation of coal gas were coupled in such a way that now synthetic natural gas is continuously produced. In respect to its heat content, its chemical composition and its burning characteristics, this gas is totally equivalent to natural gas. Thus, coal gas produced from coal, which has been used until now only as a fuel in industry and as a raw material in chemistry because of its quality, can be made usable for the public energy supply by converting it into synthetic natural gas.

In the case of the methanation process which Thyssengas, Ltd, the long-distance gas company in Duisburg, and Didier Engineering, Ltd, Essen, have developed, we are dealing with a technically and economically especially advantageous single-stage fluid bed process.

The development work was given special support by the Ministry for Research and Technology (BMFT).

The process was developed over a period of 6 years. From a chemical point of view it transforms carbon monoxide and the hydrogen in the coal gasification gas into methane (thus methanation) which is the major component of the natural gas.

From development to technical application the research project comprises three phases: The first phase of the development of the process was successfully completed this spring. It took place in a semi-technical experimental plant which produced up to 400 m^3 of synthetic natural gas per hour. The plant is located on the works site of the Ruhr Chemie Co in Oberhausen-Holten, which also provided the necessary operating resources.

The second development phase is a pilot plant (large experimental plant) which is currently under construction. Starting October 1981 it is supposed to provide important design data for a planned industrial production plant and to produce 1,500 m^3 to 2,000 m^3 of synthetic natural gas per hour. The BMFT is supporting the experimental and pilot plant (total cost DM60 million) with about DM35 million of public funds.

An industrial plant as the completion of the development process--phase three--would be able to produce about 100 million m^3 of natural gas per year starting in 1985. It would operate in a grid system with other coal gasification plants planned in North Rhine-Westfalia. But it is also conceivable to utilize the Thyssengas methanation process, which has the internationally protected name "Comflux" process, in other German and foreign coal gasification projects.

12124
CSO: 3102/87

FRG PROCEEDS CAUTIOUSLY WITH COAL CONVERSION PROGRAM

Duesseldorf CHEMISCHE INDUSTRIE in German Nov 81 p 657

[Text] For reasons of energy and industrial policy, the most modern and most promising processes for coal gasification and coal liquefaction are to be demonstrated on an industrial scale, taking into consideration the requirements of environmental protection. This was the decision of the Federal government on 21 October 1981 in setting forth additional steps for implementing the 30 January 1980 coal conversion program.

In the coal gasification sector companies have put forth planning studies on technology, economy, location and environment for seven coal gasification projects. Because of the problems they cause for the environment, coal gasification plants, among others, are required by the federal emission control law to secure a license. A license was already issued for one plant on the basis of this law. For the other plants as well, the companies are assuming that they can meet all environmental requirements.

As the planning studies of the companies show, there are such high economic risks that it is impossible to count on the realization of these plants without state assistance, or at least not until quite a bit later.

Therefore, the federal government has decided on the following kinds of assistance:

--investment subsidy up to 40 percent (up to 50 percent in justified exceptional cases)

--with the use of German hard coal, price equalization for 5 years to third country coal of maximum DM/ton hard coal units.

The projects which are the most promising in respect to energy and industrial policy are to be chosen for support by an application procedure. A total of DM1 billion has been included in the 1982 budget of the minister for economics and in the medium-term financial planning up to 1985.

In the coal liquefaction sector there are recommendations for three large projects to hydrogenate hard coal and one project to hydrogenate brown coal. A planning study is available, two others are to be completed by the end of 1981.

The basis of coal liquefaction is the further developed IG Farben process for direct hydrogenation, by means of which even today non-usable heavy oils and refinery residues can be processed.

Because of the problems they cause for the environment, liquefaction plants are subject to the same licensing procedures as coal gasification plants.

The companies assume that they can meet all legal environmental requirements--even if at substantial investment cost.

In respect to space requirements only a limited number of locations in the FRG can be considered. Liquefaction of hard coal is--even with the use of imported coal--not yet economical either. Thus, today 1 liter of gasoline made from German hard coal would still cost almost twice as much as gasoline from petroleum.

In the second half of 1982, after evaluating the planning studies, the federal government will decide about additional help to realize one, at most two industrial coal liquefaction plants. The granting of a hydrogenation preference will be specially tested for the operation of such plants. To reduce the technical risks of the large plants a program of component development for the purpose of advance testing of especially critical parts will be implemented. There are approximately DM 100 million available for this in the budget of the minister for research and technology.

12124
CSO: 3102/87

ENERGY

DEMONSTRATION COAL LIQUEFACTION PLANT IN VOELKLINGEN

Frankfurt/Main FRANKFURTER RUNDSCHAU in German 21 Nov 81 p 5

[Article by Guenter Hollenstein: "The Saarland's Dreams Of Coal Liquefaction: First Pilot Plant In Voelklingen; Many Question Marks Concerning Its Rationality"]

[Text] Necessity is the mother of invention, according to the proverb. And because the population of the Saarland is not exactly blessed with a flourishing economy--its steel mills have been in critical straits for years and the unemployment rate is correspondingly high--the state's politicians have been grasping at every straw that might help them out of their misery. The praise was practically gushing, when a pilot coal liquefaction plant was put into operation recently at Voelklingen.

Minister of Economics Werner Klumpp (FDP) attested to the "vital interest" of the Saarland in coal liquefaction. The German Federation of Labor Organizations (DGB) calculates that the construction of a large-scale plant, which is scheduled to follow the pilot installation after the end of 1983, should "directly" generate some 3500 new jobs. And the head of British Petroleum in Germany, Helmuth Buddenberg, who with its daughter firm Gelsenberg, shared half the costs of the "Society for Coal Liquefaction" (GFK) with the Saarberg AG, boasted of its "high political priority." There was only oen reservation. The chairman of the Saarland SPD, Oscar Lafontaine, was heard thinking aloud about who was to finance the large-scale plant ("a ghost project") estimated to cost some DM 3 billion. This produced the reproach from the governor's office that he was being "an irresponsible opposition politician."

What is now being tested in Voelklingen had once seen better days. The hydrolization process which was originated by IG Farben in the 1920's, was able to produce some 4 million tons of motor fuel per year in 1943/44, when there were 12 such installations in Germany. The technical director of the GFK expressed his regrets that continuity had been broken off after the war. Now, in a time of ever higher oil prices, coal liquefaction has again come back into its own.

Economic considerations have little to recommend motor fuel derived from coal, no matter how high the price of oil might rise. One liter of super benzene obtained from coal could not be sold for less than DM 2, according to calculations done at the end of 1980. Within this hypothetical price is included the petroleum tax, though not the costs for marketing or transport. Its proponents are therefore talking of a "synthetic preference," meaning that the federal minister of finance should renounce the tax placed upon benzene produced in this fashion.

But even its yield is limited. The degree of efficiency of a hydrolization plant lies between 55 and 60 percent, while traditional refineries operate at an efficiency of over 80 percent. Because the production of a ton of domestic coal costs up to DM 230, while a ton of less "wage intensive" foreign coal extracted through strip mining costs DM 40 to 50, the GFK sees technology export as its principal task. Alongside the "economic significance" ascribed to the large-scale hydrolization plant (output: 2 million tons annually) and the "energy-political effect" because less oil would need to be imported, Wuerfel sees real technology export opportunities in those countries where coal is cheap.

Yet here the competition already has a head start. The Americans now have two plants in operation, the Japanese are already working on the process; Australia, South Africa and Canada are where sales are expected. Significantly, Veba and Ruhrkohle have also committed themselves to the cause of coal liquefaction. They have set up a pilot installation in Bottrop which is now processing some 200 tons of coal daily. In contrast, the Voelklingen pilot plant with its daily 6 tons suggests a toy. Whether the federal government will make any generous contribution to the construction of a large-scale plant is still an open question.

9878
CSO: 3102/91

BRIEFS

FUEL OIL-COAL MIXTURE--After joint research efforts carried out by the French Refining Company (Total Group), CERCHAR [Center for Studies and Research on French Coal Mines], the national company Elf-Aquitaine, Creusot-Loire and the IFP [French Petroleum Institute], on a mixture consisting of coal in a fuel-oil suspension, the first test in France as well as in Europe will be conducted using an industrial trial boiler. This boiler, designed to burn standard heavy fuel oil to produce 50 t/hr of steam, will be fired with a fuel oil-coal mixture. The test will take place at Montceau-les-Mines (Saone-et-Loire) in a boiler room of the Houilleres du Bassin et du Midi. It will consist of operating a pilot fuel oil-coal mixture production plant with a capacity of 8 tons of mixture per hour. This unit will feed the boiler through an intermediate 100-m^3 fueling tank. The test will also provide a study of the use of such a mixture in a boiler in an industrial environment and of the equipment and operational changes that will have to be made. The fuel oil-coal mixture, which contains up to 50 percent of coal by weight, can be produced at a price somewhere in between that of coal and that of heavy fuel oil. It also has the advantage of being transportable, unloadable and stockable by the means normally used for heavy fuel oil. The installation, now under way, will be operational by February 1982 and the tests will be conducted throughout the first half of 1982. The operation is being financed to the extent of 30 percent by the Ministry of Industry, under a program that since 1980 has been carried forward by the same partners and has been aided by the DGRST [General Delegation for Scientific and Technical Research]. This initial program has been centered on obtaining stable coal suspensions in fuel oil and on testing their use and and combustion characteristics in pilot installations. [Text] [Paris CHIMIE ACTUALITES in French 20 Nov 81 p 12] 9399

CSO: 3102/98

RENAULT PUTS SECOND-GENERATION ROBOTS INTO SERVICE

Paris ELECTRONIQUE ACTUALITES in French 13 Nov 81 pp 1,3

[Article by G. Bidal]

[Text] The Regie Renault is currently putting into operational service the first several of its second-generation robots--robots, that is, utilizing a shape-recognition system. This system can be considered the first industrial version of of a robot capable of taking hold of nonplanar parts at three-dimensional random.

The term "robot" has tended to become inflated with usage over the past several years, but with the latest models developed at Renault's Division of High Technology (DTA) there can be no doubt: They are truly second-generation robots capable of reacting to the environment, thanks mainly to their system of image analysis by means of video cameras. The Regie is exhibiting at the Palais de La Decouverte in Paris a vertical 8-axis robot capable of taking hold of a complex isolated part placed on any position whatever on a moving belt. Through the use of a standard video camera, the system analyzes a square image 1 meter on a side in 256 x 256 values of gray. By calculating the barycenter, then the orientation angle, it is able to recognize the face on which a nonplanar part is resting. The picking up of the part and positioning of it on a machine are functions of this image. Without going into details of the system (obviously, Renault is not divulging its recognitional algorithms), we can simply say that it is a technique for measuring characteristic dimensions, then comparing the results with the different values learned for each dimension in each possible position.

But Renault is going a step beyond this with a shape-recognition system that is already in preoperational service in many Renault plants, which gives different robots the ability to select and pick up nonisolated, randomly positioned parts. A case in point is a prehensile robot that feeds a machine tool from a pile of parts in three orthogonal axes (in this particular case, pallets of crankshafts). The shape-recognition system operates in two stages: First, it isolates each part in the pile (at this stage, imaging data are correlated using a supersonic telemetering system to determine the height of the top of the pile). In the second stage of the operation, once the part's contours have been isolated, its position is determined by the method described above for the recognition of isolated parts. To our knowledge, this is the first industrial recognitional system of this type,

operating, that is, on a 3-dimensional basis. The industrial random-pickup systems in use to date work, for all practical purposes, in a single plane.

A Universal Calculator

From the electronics standpoint, Renault has developed its own 16-bit control calculator, called Version 5. Developed by the DTA jointly with Renault's SMC [expansion unknown] subsidiary, it is being added little by little to all the robots installed in Regie plants. This busbar-type modular calculator is designed to manage fixed-cycle manipulators as well as second-generation shape-recognition robots, whatever the application of the latter (painting, welding, manipulation). This calculator will soon be made compatible with Intel's standard SBC, so as to at, one and the same time, increase its modularity, take advantage of new interface possibilities, and facilitate its manufacture and marketing in the United States by Cybotech, the joint Renault-Ransburg subsidiary. Formed a year ago, Cybotech has begun building Renault robots and, at work on its own plans, is in the process of spinning off from the Regie to enter the formidable market that is opening up in the United States to replace almost entirely the automotive industry's production tooling (representing investments totaling over $80 billion).

In France, the shape-recognition system, like all the group's robotics product line, is to be manufactured by Acma-Cribier. After having produced its first electrically powered robot, the TH 8, Acma will now market a new hydraulically powered vertical robot, the V 30 (for the handling of loads up to 30 daN). With this model, Renault will have a complete gamut between 5 and 80 kg. As of now, this gamut can be considered, from a practical standpoint, closed. The principal developments will now be centered on software, sensors and electronics: Thus, it is planned to insert the signal-processing electronics in the base of the robots, which will reduce the interconnections between the calculator and the robot to a single small cable.

9238
CSO: 3102/67

PLAN PRESENTED TO DEVELOP MACHINE TOOL INDUSTRY

Paris AFP SCIENCES in French 3 Dec 81 p 9

[Text] Paris--At the Council of Ministers meeting of 2 December, the minister of industry presented a plan to develop the machine tool industry, which was drawn up at the request of the president of the Republic and which envisions doubling the volume of French machine tool production between now and 1985. This plan is based on the rapid development of numerically controlled machines, which is one of the keys to the recovery of the domestic market. The plan is designed to contribute to the development of exports and provides for the retraining of personnel to qualify them for more skilled jobs.

For the period 1982-1984, the Council of Ministers has decided to proceed along three lines as follows:

1) Reorganization of the machine tool industry and of the principal suppliers of components:

To replenish the funds of the enterprises themselves, meet the industry's investment and innovational needs and develop exports, the financial requirements have been calculated at Fr 4 billion.

The state's contribution, for its part, could be as high as 50 percent of the required funds. The beneficiaries of this unprecedented effort would, for their part, be asked to sign contracts that would stipulate their developmental undertakings.

2) Launching of a program of technological innovation:

Multi-year collective research contracts, totaling Fr 200 million, will provide for the institution of three national technological axes, giving rise in turn to regional prolongations.

Each enterprise's own research effort will be developed.

3) Procurement of State-of-the-Art Equipment:

In 1982, the total available for improvement-incentive loans to the robotics industry will be substantially increased over 1981, when it was already Fr 1.2 billion.

Moreover, the procurement of state-of-the-art equipment and accessories will be encouraged, particularly in the case of the PMI's [Small- and Medium-Size Industries].

Lastly, government orders for machine tools, the total of which will be brought up to Fr 1.2 billion over a period of 3 years, will be centered on modern equipment, with a view to providing, in the educational and occupational training sectors, improved training in new techniques.

9399
CSO: 3102/98

MINISTRY OF RESEARCH, TECHNOLOGY TO BE REORGANIZED

Paris AFP SCIENCES in French 3 Dec 81 pp 1-3

[Text] Paris--A reorganization of the Ministry of Research and Technology, involving the elimination of the DGRST [General Delegation for Scientific and Technical Research] and the DIT [Delegation for Innovation and Technology], as such, was decreed on 1 December.

Actually, the DGRST--which had already been reassigned to the Ministry of Research -- and the DIT--which had been under the tutelage of the Ministry of Industry but which Mr Jean-Pierre Chevenement had taken over as part of his functions when he took office--have merged to form two principal directorates within the Ministry of Research: The Directorate for General Policy and the Directorate for Scientific and Technological Development and Innovation.

In accordance with the decree of 1 December, published in the JOURNAL OFFICIEL of 2 December, the executive function of the Ministry of Research and Technology will be organized as follows:

1. An Office of Science and Technology.
2. A General Policy Directorate;
3. A Directorate for Scientific and Technological Development and Innovation;
4. An International Affairs Service;
5. A Forecasting and Evaluation Center;
6. An Interministerial Office of Scientific and Technical Information
7. Minister's private departmental staff and services:

   --Minister's Private Office staff,

   --Press and Public Relations Office,

   --Highly-placed Defense Ministry Official.

The Ministry of Research and Technology will have a regional delegation in each region.

The Office of Science and Technology will consist of departments and will be under a Head of the Office of Science and Technology.

It will examine and follow up the scientific and technical aspects of all matters within the province of the Ministry, particularly as regards the Office's relations with the other bodies forming part of the Ministry, and to this effect will establish all the liaisons necessary with the bodies concerned.

It will provide the Ministry's directorates and services all the scientific and technical elements needed by them to accomplish their missions and will take part with them in the definition and implementation of the Ministry's policy in the domains of research and technology.

The General Policy Directorate will:

--Gather and disseminate statistics relative to scientific research activity and technological development. It will maintain an inventory of the nation's potential in this domain;

--Define the general guidelines of research and technological development at the programs and overall-balance-of-effort levels, and will oversee their implementation. It will contribute to the drawing up of the Plan and of program budgets in the research and technology domains;

--Form interministerial scientific and technical research committees;

--Allocate budgetary funds to the bodies or agencies under the tutelage or joint tutelage of the Ministry and oversee their utilization. It will receive and examine all proposals relative to research and development funding submitted to the Ministry for purposes of coordination, allocate the funds and audit their utilization.;

--Provide the tutelage or joint tutelage of the bodies or agencies forming part of the Ministry;

--Conduct the general management of the Ministry.

The Directorate for Scientific and Technological Development and Innovation will foster by all possible means the advancement of French scientific and technical research, and will:

--Maintain relations with the enterprise sector, particularly with the national enterprises; propose and put into operation, jointly with the interested ministries, the means, particularly financial, to ensure the rapid progress of the research, technological development and innovational effort;

--Examine the research programs of national enterprises and in this connection takes part in the drawing up of development contracts between the state and these enterprises;

--Study, propose and put into operation the means to valorize and disseminate public sector research to the enterprise sector; establish to this effect all the necessary liaisons with the bodies or agencies concerned;

--Put into operation all the incentive credits in the Ministry's budget designed to foster cooperation between government bodies and enterprises and valorization of the priority programs in the research and technological development domains;

--Represent the Ministry in interministerial initiatives concerned with defining and putting of technological and industrial policy into operation;

--Exercise tutelage over the National Agency for the Valorization of Research and all the functions previously exercised with respect to industrial and technical research, particularly as regards the activity of the industrial technical centers, by the DIT;

--Jointly with the Regional Delegations of the Ministry, which it coordinates, and relying upon the International Affairs Service, vitalize the tissue of French industry from the standpoint of technological development and innovation.

The International Affairs Service will:

--Jointly with the interested ministries, act on problems of international scientific and technical cooperation. It will foster and coordinate in these domains the action of the research and technological agencies;

--Jointly with the Ministry of Foreign Relations, orient the activity of the scientific advisers and attaches abroad. It will gather and keep up to date information on the scientific and technological policies of foreign countries;

--Jointly with the interested ministries, promote the product of national research and technologies abroad and provide support for the mobilization of all French research and technological agencies to serve the developing countries.

The Forecasting and Evaluation Center, which will have its own budgetary funds for this purpose, will:

--Study the evolution and the future potentials of research efforts and technologies from the national and international standpoints;

--Evaluate the progress and impact of research and technological developmental programs.

9238
CSO: 3102/97

BRIEFS

RESEARCH BUDGET ADOPTED--Paris--The senators adopted the budget of the Ministry of Research and Technology on 2 December. "We shall see to it that, by the end of this decade, France will be the world's third-ranking scientific and technological power," said the minister, Mr Jean-Pierre Chevenement after having recalled the six priorities of the present government: biotechnology, rational use of energy and new sources of energy, the electronics and robotics sectors, research on employment and working conditions, research in cooperation with the developing countries... "These priorities are not exclusive," he said. [Text] [Paris AFP Sciences in French 3 Dec 81 p 10] 9238

CSO: 3102/97

BRITISH DIRIGIBLE: MODERN MATERIALS, NOVEL PROPULSION

Paris SCIENCES & AVENIR in French Nov 81 pp 7-8

[Text] The-long-talked of "new dirigible" has finally appeared in the form of a palpable realization: Near the end of September, at Cardington, a "lighter-than-air" craft took to the air for its first flight, which lasted 2 hours. This "supple" 5,000-m^3 dirigible, capable of carrying a 2-ton payload, appears somewhat disappointing at first glance. Its architecture is actually ultra-conventional, and nothing seems to distinguish it from the designs of the 1930's and even earlier ones.

Its promoter, the British firm Airship Industries, affirms nevertheless that the Skyship 500 (or AD-500) is novel as regards three essential features: The lightness of the cabin (made of Kevlar for the most part), its vastness and comfort notwithstanding; the use of a sophisticated material comprising a polyester fabric, a polyurethane coating and, on its inner surface, a "gas barrier" film that reduces its permeability to helium by 80 percent (thus reducing its losses, which are costly, to one-fifth), for the skin of the hull; and the use, for its propulsion, of two steerable, streamlined, variable-pitch fans, each driven by a Porsche 200-hp flat-6 engine.

It is the latter feature that is the real innovation, the others being merely the use of modern materials and technologies. The steerability of the fans puts at the pilot's disposal a true vectorial thrust that is rapidly adjustable in intensity and direction. In the case of a conventional dirigible, the equilibrium between its buoyancy and its weight is always difficult to obtain and depends on a number of hard-to-control factors. In the case of the AD-500, the pilot will at all times have control of this equilibrium, even (and especially) at a stationary altitude; the lift-off as well as the return to ground--which are the most difficult phases in the use of a lighter-than-air craft--will thus be considerably easier.

The fact is that there has already been a first AD-500, which began its tests with successful results in February 1979. It was quickly destroyed by a storm as the result of an unwise maneuver. The second AD-500 bears a close brotherlike resemblance to it, and for good reason: It is identical in every respect, except for a few very minute changes (mainly, reinforcement of the forward mooring cone). Everything, or almost everything, with respect to the operation of dirigibles must now be relearned...

As far as can be judged, the new AD-500 is attracting sufficient interest to justify the building of a second one, which is already under way--with, as for the first one, a substantial participation by French industry: The skin, the valves and the rigging of the nacelle were designed at Issy-les-Moulineaux and fabricated at Cognac by Aerazur-EFA (Zodiac group); the special fabric is supplied by a firm of Roubaix, Pennel et Flipo. And Airship Industries has now announced an AD-600, a little longer (53.5 meters versus 50) whose capacity (6,400 m^3 versus 5,100) and increased power (2 x 250 hp) will mean greater speed, more range and a payload capacity of 3 tons.

Its projected uses? In the first place, surveillance of coastal zones under ideal conditions of comfort (hence efficiency) for the crew. Announced cruising ranges are up to 20 hours for the AD-500 and 70/80 hours for the AD-600; but the observers have lounge berths and a real mess hall. Economy of operation is another strong incentive to the use of lighter-than-air craft: In this case, fuel consumption will be infinitely less than that of a plane or helicopter.

Another projected use: Antisubmarine warfare (airborne radar), the seeding of mines or their destruction, through the use of a small towed glider near the the sea surface, and, in sum, transportation in various forms.

Of course, this is still a far cry from futuristic dirigibles of the "flying saucer" type or other configurations conceived by certain inventors. The Skyship 500, however, if it succeeds in taking hold, will impart to the latter a new credibility. It remains to be seen whether the new dirigible will prove too susceptible to atmospheric conditions. It is nevertheless a good bet that the Skyship 500 will eventually materialize in a conventional, hence reassuring, but probably efficient form. It is worth following closely...

9399
CSO: 3102/82

INDEPENDENT COMPANY DESIGNS 'VSS' FOR FIAT

Paris L'ARGUS DE L'AUTOMOBILE in French 29 Oct 81 p 10

[Article: "IDEA Institute: An Effective Backup Institute for the Builders"]

[Text] Renaissance Italy had its condottieri, remarkable military leaders who did not hesitate to transfer their services, complete with weapons, baggage and troops, to their erstwhile enemies, provided the latter paid more.

The industrial--and planetwide--war that rages in the automobile sector has fired the rebirth in Italy of the "product and industry condottieri." First, Giugiaro created Ital Design, which was capable not only of designing any vehicle but also --a new--of industrializing it: The only thing its builder client had to do was actualize the tooling conceived by Giugiaro's engineers and launch the mass production of the model...

The IDEA [expansion unknown]Institute, created 4 years ago, has gone a step further. The team working with Doctor of Engineering Franco Mantegazza is capable of creating a new automobile from A to Z, from its styling and mechanical design through its production cycle to and including its marketing.

Indispensable

IDEA's remarkable VSS (see L'ARGUS DE L'AUTOMOBILE of 8 October) brought out by Fiat a short time ago was designed and fully built by the IDEA Institute before being evaluated and tested by Fiat. It is not to be concluded from this that Fiat's design division is incapable of designing and actualizing a "subsystem-type vehicle" such as this; the fact is that it is 100 percent taken up in tasks that have been set up for it by plans of long standing, so that even a few of its engineers could not be detached to work on a "parallel" project, as ingenious as the VSS though it might be.

Most ingeniously, Fiat heavily financed the project and left it entirely in the hands of IDEA's engineers, not without having first reduced the scope of their preliminary design plan, which would have taken too long and been too costly to carry through to completion.

This "parallel" technique, a source of creativity worthy of emulation, is not new: However, it is practiced more in its internal form (as at GM) than its external one, although it would seem that the latter is more productive. The creative freedom enjoyed by designers external to the builder is total. Franco Mantegazza, the founder of IDEA and a former Fiat engineer, has made of this freedom a cardinal principle of the firm: He categorically refuses participation by any of its clients in the capital of the institute so as to be free of any pressures. He is thus in a position to recommend this or that new solution, without being obliged, as he would be if he worked within the confines of a group, to settle for other perhaps less favorable solutions because they could more easily be implemented by a subsidiary or because they were more economically viable.

At one time, beech trees were planted around oaks to induce faster and straighter growth; today, builders place their design divisions in competition with small, more flexible, rapid and creative firms, to keep their engineers from getting too wrapped up in red tape and resting on their laurels.

A Chip Off the Fiat Block

It is not without good reason that Fiat is IDEA's first big client: Ninety percent of the engineers who make up the Institute's "gray-matter" capital came to it from Fiat. Its creator, first of all, made his career at Fiat and in France, where he worked. But Franco Mantegazza is not an ordinary figure. Despite his very Italian name, he admits to speaking German better than Italian! At the end of the Second World War, he left disarrayed Italy to finish his engineering studies at Zurich's Polytecnicum. There he made friends with young Germans in the same situation as his own. Thus, even today, Dr Piech (the head of technology at Audi-NSU) and Dr Rademacher (BMW) have remained his friends, which attests to the high technical circles in which Franco Mantegazza has always traveled.

His assistants? They are named Cordiano, Hruska, Montanari, Puleo, Bossaglia, Formia, Greco, Garnero, De Silva: All have occupied very high positions of responsibility for the creation of new models, engines or production methods at Fiat, Iveco, or Alfa Romeo. Working with them is a string of specialists in metals, stamping, methods, automation,industrialization and organization in general. They are--for example, Ghebbano, Dullio, Sibona--very well known and have already made their mark as high-level consultants with Pininfarina or Ital Design.

Being Different To Create

Reading this impressive list of "tenors," one might be led to believe thar the IDEA Institute lives only on the automobile. This is far from being the case. IDEA's most prestigious associate is none other than Oscar Niemeyer, the architect of Brasilia, number one worldwide in his specialty. The former vice president of IDEA, temporarily detached from it on a year's sabbatical, is Renzo Piano, the architect who calculated the structures for Beaubourg. IDEA is also a "climate" in which specialists in all disciplines are assured of being able to exchange ideas and techniques with full freedom. This is why IDEA's head office is a marvelous villa, baptized Cantameria, perched atop the hill of Moncalieri, near

Turin, in the middle of a dense forest. In this pleasant environment which towers over Turin--literally and figuratively--bold projects are being worked out concerning the automobile, architecture, metallurgy, and new techniques in general. Transient guests are welcomed with open arms, regardless of their nationality, and may work in total freedom; if the drawings we publish herewith appear to be annotated in faulty French, Italian or English, you may rest assured they were conceived by Japanese architects!

Keeping IDEA Alive

The VSS is IDEA's first "major work" to have been rendered public, but it will not be the last. The Institute competed (against Porsche) for the design of two vehicles for the Soviets. The match was a draw: Porsche will design one of them, IDEA the other. While the new Soviet "Zaporojets" will be 100 percent IDEA, the Institute is also preparing a complete redesign of the instrument panels and air conditioning of Alfa Romeos: From the basic Alfasud to the Coupe V6, all units will be "modular," efficient and reliable. Another project for Alfa Romeo is about to be completed: The design of an Alfa Romeo 4x4 (of the Lada type) which could bring the Milanese firm out of the red. Thus, Alfa Romeo, which had found it necessary to join with Nissan to produce a new vehicle rapidly, was quick to get IDEA (where engineer Hruska, former chief engineer and manager of Alfa Sud, is vice president) to rapidly create a new innovative model.

An amusing detail: The Soviets, finding IDEA's financial standing a bit limited (600 million lire, or approximately Fr3 million, invested by F. Mantegazza) insisted on increasing it. F. Mantegazza refused all their offers and got (within his own family) Count Charles Ferdinand di Boromeo (owner of the islands of the same name) to back him with a minority share and the presidency of IDEA!

Although the automobile represents 80 percent of IDEA's activities, the architectural sector is no less creative: Innovative appartment systems, sports and social centers--also modular--and superb industrial designs attest to the fact that it works fast and well.

Always Out Front

At Villa Cantamerla, Dr Mantegazza showed us super-lightweight crankcases made of magnesium: The new alloy developed by IDEA does not burn, is easy to fabricate and to machine. Although it is still a bit more costly than the second-melting aluminum generally used in the industry, it is much less so than first-melting aluminum. It could also free certain industries of the monopoly exercised by seven big companies that control the aluminum market. The people at IDEA know how to live with the times, address the problems of raw materials and energy, and evaluate in their true perspective the economic and political impacts of each discovery.

Dr Mantegazza is also working on the development of Alfasud's 4-cylinder pancake engine. Conceived by his friend Hruska, the one he calls "the greatest living prophet of the automobile," this remarkably compact, low-profile, reliable power plant could be in for a revival thanks to IDEA...although we were not told exactly how this might be brought about.

Getting Back to Basics

The osmosis that prevails between the different engineers--the extremely effective process of "relaxed creativity"--at IDEA sometimes brings forth surprising solutions to known problems. Thus, the chassis of a multiple-use, farm utility vehicle was made of reinforced concrete, a solution that turned out as highly resistant and reliable as it was cheap to produce.

The architects designed the IDEA double roof (rejected by Fiat) starting from the (basic) idea that it is idiotic to consume energy with an air conditioner when, from 20 km/hr up, the displacement of the automobile can provide the necessary conditioning if the roof (with a Venturi opening and proper diffusion of the air) is correctly designed.

Another conceived in the Villa was that of flooring with "technical tunnels" for cables and channelings--which could have led to the development by IDEA of an injection-molded platform floor.

Refused by Fiat, the idea was ceded to Mantegazza's friend Piech, who made good use of it: The star exhibit at the Frankfurt Show was his Auto 2000 featuring precisely a "plastic and fibers," solid, anti-corrosion floor capable of revolutionizing fabrication methods, in that the seats can be mounted on the flooring platform before attaching the body to it.

This way of getting back to basics, of expanding the techniques applicable to the automobile, is characteristic of IDEA and of all its small creative teams. A realist, Franco Mantegazza sees before him an ever widening niche. "The automobile has become a barren product," he says, "in that investment of "ex novo" creativity, getting back conceptually to the basics of every element. is hardly feasible any more because it is too costly even for the big builders."

Knowing How to Choose One's Counsellors

Although it has its own pool of the world's best brains and its own very powerful calculator, IDEA farms out certain problems to "super specialists" such as Open Design (Aldo Sessano, father of Mitsubishi's Lancers) for styling, IPS [expansion unknown] for bodies, UCS [expansion unknown] for upholstery, IC [expansion unknown] (regular consultants to Pininfarina and Alfa) for planning, Emo Electronics for electronics. For the VSS, the vast bundle of resistance calculations for the "reticular frame" was done by the British OVE-AROP [expansion unknown] and Partners. On the other hand, the extraordinary knowledge of plastics displayed by IDEA in the design of Fiat's VSS is that of its own team. Franco Mantegazza explains his rationale (laughingly) saying that until now the best part of his revenues come from a plant for manufacturing plastic injection machines and molds! "Thus, I keep up to date not only on what is being done now but also on what is being planned for years to come. I claim no merit for this."

Remaining in Europe

Personal merit or none, IDEA's staff is unquestionably one of the most extraordinary we have ever encountered. Such enthusiasm, such competence, such dedication to beauty and to effectiveness must remain European: This is the desire of IDEA's "phalanstery." Advice to the builders of old Europe: You have in your hands one of the keys to the future of the automobile. Do not let the Japanese and the Americans--always the most numerous at Moncalieri--use it before you do: You could rue the results!

9399
CSO: 3102/75

RENAULT 5 LINE IMPROVED FOR BETTER MILEAGE

Paris L'ARGUS DE L'AUTOMOBILE in French 5 Nov 81 p 1

[Text] Save gas! This is the aim of the Regie Renault, which month after month remodels its line to offer its customers ever more conservative models.

Looking back, in 1979 the Renault 5 TL and GTL reached a gas-mileage milestone at under 5 liters per 100 km at 90 km/hr. Research management was still not satisfied and continued its efforts. In April 1981, the new Renault 5 Automatic improved its mileage by 9.4 percent, and in July 1981 the basic 1982 Renault 5 improved its mileage by 10 percent.

Today, it is the Renault 5 GTL's and the Renault 5 TS's turns to mark up a new mileage gain.

The 5 GTL: 4.5 Liters per 100!

Thanks to a new 5-speed transmission and a new front-end spoiler shield the Renault 5 GTL has taken another step forward in terms of mileage. The gain is 6 percent and the average of the three UTAC [expansion unknown] standards has been lowered from 6 liters per 100 km to 5.63 liters per 100 km, the respective mileages being: 4.5 liters per 100 at 90 km/hr, 6.1 liters at 120 km/hr and 6.3 liters in the city. This 5-speed Renault 5 GTL costs 39,000 francs in the 3-door version and 40,400 francs in the 5-door version, or, only 500 francs more than the 4-speed versions.

The 5 TS: 5.2 Liters per 100!

For the 1982 Renault 5 TS, the mileage gain is even more impressive: 13 percent. Thanks to a new 1,397 cm^3, 63 hp engine, a 5-speed transmission and a new spoiler, the 90-km/hr, 120-km/hr and city mileages drop respectively from 5.8 liters to 5.2 liters, from 7.8 liters to 6.7 liters, and from 9.2 liters to 8 liters, with a top speed increase from 151 km/hr to 154 km/hr. The 3-door Renault 5 TS is being offered at a price of 41,300 francs.

Fully equipped Renault 5 TX

The top of the Renault 5 line has now been completed by a "TX" model at a price of 47,300 francs for the 5-speed version and 48,900 francs for the Automatic version. These versions, fully equipped and therefore without options, feature power steering and electric window raisers, tinted windshield and windows, a leather-sheathed steering wheel, alloy wheels, etc. And at the summit, there is still the Renault 5 Alpine Turbo at the current price of 55,000 francs.

18 GTS: 5.9 Liters per 100!

The 18 GTS 4-door sedan and station wagon are now equipped with a 1,647-cm^3, domed cylinder head, 96-hp engine, an increase of 17 hp. Their maximum torque increases from 12.5 mkg at 3,000 rpm to 13.5 mkg at 3,500 rpm. At the same time, their 0 to 100 km/hr acceleration time decreases from 12.8 seconds to 12.1 seconds. Yet their mileage has been improved from 6.1 liters to 5.9 liters/100 km at 90 km/hr, and from 8.2 to 7.8 liters at 120 km/hr. In the city, however, it is now 10 liters per 100 km in lieu of 9.9 liters.

The station wagon in this GTS version, is new. It has received special treatment, characterized outwardly by its functional, chromium roof rack, and internally by its plush upholstery. Like the 4-door sedan, it has an internal rear-view mirror control, electric front-window raisers, centrally controlled electromagnetic door locks, an instrument-panel-mounted oil level indicator, etc.

In addition, the entire 1982-built Renault 18 line has benefited from improvements affecting their road performance (decreased flexibility of front-end suspensions, stiffening of the rear-axle assemblies, new calibration of the shock absorbers) with a resultant reduction in body sway during turns and braking. Passenger comfort is improved by a new seat-cushion design, while leg-room is increased by a modification of the front seats (in the 4-door sedan) that offers rear-seat passengers more foot- and knee-room.

The Renault 18 GTS is priced at 54,200 francs for the 4-door sedan and 58,100 francs for the station wagon.

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CSO: 3102/83

BRIEFS

NEW GENERATION FIAT 127--Fiat will shortly market a new-generation Fiat 127 which has been completely restyled with respect to the older version and which has undergone certain technical modifications. The line will include three versions of the 900-cm^3, 4 hp 127, one of which will have a 5-speed transmission, and a 1,300-cm^3, 7 hp 127 Sport, also with a 5-speed transmission whose ratios, however, have been revised to improve performance. Having already sold 5 million cars since its creation, the 127 line bids fair to intensify its career, the more so since, pending the marketing of the UNO, planned for next year-end, a Diesel model is scheduled to appear in January 1982. The 127 Sport 1300 is rated at 165 km/hr peak speed and a time of acceleration from 0 to 1 km of the order of 33.7 seconds. A great deal of work has gone into its carburetion to improve specific consumptions, but Fiat has not yet divulged its figures. As to its appointments, the new 127 will have new-style seats, a "functional" instrument panel, and internal insulation that will improve the environmental noise factor. The new 127's will be available beginning in January. They will range in price from 28,000 francs to 33,000 francs. [Article by P.H.] [Text] [Paris LE MATIN in French 30 Nov 81 p 17] 9399

CSO: 3102/83

END

JPRS 80053

8 February 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 90

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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JPRS 80053

8 February 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

No. 90

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BRIEFS

BIOLOGICAL RESEARCH INCREASES--In 1982 the German Research Society will establish at the Technical University of Munich two new special research areas: "Biological and Technical Fundamentals of Bioconversion," and "Primary Processes of Bacterial Photosynthesis." Of all German technical universities, the Technical University of Munich--alongside the Technical University of Aachen--houses the largest number of special research areas, ten to be exact. They are financed 75 percent by the federal government and 25 percent by the states. The German Research Society determines the topics according to current research requirements and awards the studies to the centers with the highest qualifications. Bioconversion is any material conversion in nature which is aided by enzymatic catalysis. The research project will bring together scientists from the fields of biochemistry, cell biology, plant physiology, microbiology and organic chemistry; and it will also bring in control system engineers. The project involves research on the synthesis of natural materials and, when possible, the technical imitation of such processes. Photosynthesis is the process by which plants and bacteria build energetic chemical compounds from water and carbon dioxide using light as a source of energy. It proceeds in many small steps under the influence of electrical fields. Understanding the total process could lead to the development of molecular structures which, in technical application, would efficiently employ light in the construction of energy-rich chemical materials. The goal is the conservation of solar energy; the key is the understanding of the method by which plants and bacteria transform light into electrical energy for the development of fields. [Text] [Munich SUEDDEUTSCHE ZEITUNG in German 30 Nov 81 p 6] 9160

CSO: 3102/99

ELECTRONICS

FIRST FRENCH EQUIPMENT FOR REACTIVE ION ETCHING

Paris ELECTRONIQUE ACTUALITES in French 4 Dec 81 pp 1, 10

[Article by JPDM]

[Text] The Vacuum and Mechanics Division of the CIT [International Telephone Company] - ALCATEL [Alsatian Company for Atomic, Telecommunications and Electronic Construction] announced officially on 26 November its first dry-etching machine for integrated circuits, the GIR 200, which is also the first European etching machine for high-density integrated circuits.

This machine, which operates on a slice-by-slice basis, is quite exceptional, in the sense that it provides in a single enclosure two processes and two reactors. Its output averages 30 slices an hour and its price is relatively low (Fr 800,000).

CIT-ALCATEL currently has an annual turnover of Fr 14 million in the field of thin-layer equipment (deposition by evaporation or spraying and etching processes), which should go up to Fr 22-25 million in 1982, and reach Fr 60-70 million around 1985, owing essentially to its etching product line. To achieve this rate of growth, the Division will put into operation a new 2,500-m^2 plant, now under construction at Annecy and scheduled to be completed in June 1982, specializing in thin-layer equipment.

A Combining of Extraordinary Expertises

Down to image sizes of around 2.5 microns, the principal limitation on further integrated-circuit image-size reductions had been the masking operation. Now that the industry seeks to come down to the 2-micron and even the 1.5-micron levels, it is the etching operation that limits production yields, since masking has recently become industrialized thanks to repetitive photoreduction machines and the very imminent high-definition 1/1 projection machines.

As regards etching, the recent RIE [Reactive Ion Etching] machines have brought about a current improvement in results. But planar plasma machines are better suited to certain materials, and tubular plasma machines, which are older and more economical, suffice for simple operations of the dipping, washing and fettling type.

It is within this frame of reference that MHS [expansion unknown] contacted CIT-ALCATEL about the beginning of 1980 to examine the possibilities of developing jointly a machine capable of high yields in this domain. The prime requirements for this undertaking were quickly brought together. CIT-ALCATEL brought to the operation its know-how in mechanics, vacuum deposition and vacuum pumps; MHS its industrial experience, highly essential especially with respect to drawing up the required set of specifications; the LETI [Electronic and Technology Laboratory] its technological know-how; and lastly the DAII [Directorate of Industrial and International Affairs] its financial support. A year and a half later, the first production model was unveiled. Judging from its characteristics, it would appear to be one of the world's highest-performance machines in this domain: It features slice-by-slice- rather than batch-processing, enabling adjustment of etchings and improved production yields; availability of RIE and/or planar plasma etching to suit the etching process to the problems and materials involved; two separate reactors mounted in tandem, enabling, for example, one of the reactors to perform high-speed plasma etching operations while the other performs selective ion-etching finishing operations; nonuniformity of etching limited to 3 percent in the bottom slice; 20-slice, 3" to 5", cassette loading/unloading; and automatic or manual control by 6809 microprocessor with storage of parameters and integrated display. The circular (rather than in-line) structure adopted also avoids the presence of dual gates and simplifies the mechanical elements of control. CIT-ALCATEL did not adopt the modular structure initially (which would have increased outputs several-fold), so as to come up with a simple and relatively economical machine. The first machines will be delivered by CIT-ALCATEL beginning in April-May, six of which are now about to go into production. In 1982, delivery times should be around 5-6 months.

A Market Growth Rate of Over 30 Percent Per Annum

As we have seen, development of the GIR 200 has taken place under very favorable technical conditions. The same will be true, in principle, of its marketing, since CIT-ALCATEL already enjoys a good reputation among the world's manufacturers of semiconductors thanks to its line of vacuum pumps (30 percent of its export production going to the United States). It is not surprising therefore that CIT-ALCATEL should now be investing in the domain the company calls thin-layer equipment, the more so since the world market for etching equipment is expected to grow from $90 million in 1980 to $335 million in 1984, the growth rate foreseen for Western Europe alone being 57 percent per annum in terms of value ($30 million in 1984). The new plant will enable a production of 10-15 machines per month by 1983, most of this capacity being allocable to the GIR 200. The company is moreover working now on a batch-processing, automatic loading machine capable of processing 150 slices per hour. It should be available in 1983.

9399
CSO: 3102/101

THREE-YEAR GOVERNMENT PROGRAM TO AID MACHINE TOOL INDUSTRY

Paris ELECTRONIQUE ACTUALITES in French 11 Dec 81 p 4

[Text] The government has decided to provide major funding to pull the French machine tool industry up out of its slump under a 3-year program that will total Fr 2.3 billion. The plan features three facets: reorganization of the sector, technological innovation, and manipulation of supply and demand in favor of state-of-the-art equipment and accessories.

The plan has not actually been named an MO [Machine Tool] plan, but that is exactly what it is, and its objectives are very specific: They are, no less, to radically overturn all the trends that are contributing to the decline of the sector. Production and employment in this sector have been been going down over the past 10 years. Under this plan, production is to double between now and 1985 and grow at a rate of 40 percent a year.

The trade balance in this sector is a deficit (-Fr 1 billion in 1981). Imports are to be reduced by half and exports are to be increased by 60 percent. Its technological gap is large (less than 10,000 MOCN's [Numerically Controlled Machine Tools] installed). The plan calls for the production 5,000 MOCN's by 1985.

Reorganization

To this effect, a vast reorganization plan will be put into operation to mobilize this fragmented sector around three principal product lines. The first of these will be a "mail-order" line involving a joint effort between Hure Graffenstaden (CIT [International Telephone Company] - ALCATEL [Alsation Company for Atomic, Telecommunications and Electronics Construction]) and Ernault-Somua. As regards the other two lines--heavy machines (TMI [expansion unknown] - Berthiez et Line) and special-purpose machines (possibly Renault, who however does not appear to be in a hurry to take on the role of rescuer)--talks are less advanced. There is no dearth of problems to be resolved, particularly as to the forms such joint efforts are to take, but matters may be expected to move forward quickly and the president of the Republic has asked Minister of Industry Dreyfus to present a plan by mid-January.

Some 15 developmental contracts are being negotiated on the basis of precise commitments regarding specialized products, which should eliminate excessive competitive duplication. Several contracts concern basic components, motors (with

Leroy-Somer, CEM [Electromechanical Equipment Company]), control electronics, speed regulators and changers (with Telemecanique and CEM), and above all numeric controls (with NUM [expansion unknown]).

State of the Art and Innovation

The second facet of the government's plan, research and innovation, will be implemented by way of collective contracts totaling Fr 200 million involving major state-owned and professional organizations (CERMO [Center for Research and Study of Machine Tools], ENSAM [College of Trade and Industry], ADEPA [Association for the Development of Automated Production], and above all CETIM [Technical Center for Mechanical Industries]. The sum to be allocated to private research will about equal that for the foregoing developmental contracts. The Ministry of Research will be associated with the program through regional offices. A senior technician certification will be instituted by the Ministry of Education in informatics and industrial electronics.

The third facet places emphasis on the development of state-of-the-art robotics and flexible-shop equipment. The developmental funding to be dedicated to robotics (Fr 1.2 billion in 1981) is to be "substantially increased." Supply factors as well as demand factors will be acted upon, and the state plans to set the example by increasing its government orders, which are at present virtually nil (Fr 50 million), to Fr 1.2 billion over a period of 3 years.

The MECA [Advanced-Design Machines and Equipment] procedure being implemented by the ADEPA will also receive a strong impetus, while a purchase-lease company will be formed for high-technology equipment, including robotics.

Many measures adopted remain to be detailed, but it is evident at this point that the measures already adopted with respect to state-of-the-art equipment and high-added-value machines should translate very positively for the electronics industry--first and foremost by vitalizing a sector in which the French market gap has constantly presented an obstacle to French industrial electronics, which is not in the least lacking in technical potential (in the fields of numeric control, robotics, and motor control, for example); and secondly, because the role itself of electronics in machine tools is quite obviously being called upon to take on rapidly increasing importance.

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CSO: 3102/100

DISCUSSION BEGINS ON LEGISLATION TO IMPLEMENT R & D INCREASES

Plans Outlined

Paris LE MONDE in French 25 Dec 81 p 8

[Article by J.-F. A.]

[Text] The Wednesday 23 December meeting of the Council of Ministers began discussions with an "initial exchange of views on the main points" of the draft legislation pertaining to research and technological developmental orientation and programing, which is to be submitted to Parliament in the spring (see communique p 8 [below]). The final meeting on this matter will be held on 6 January.

This legislation must specifically provide the budgetary funds needed to achieve the official objective whereby R & D expenditures will attain 2.5 percent of the GDP [Gross Domestic Product] by 1985. This objective depends, according to an official report, upon the implementation of a very substantial funding effort in 1983.

During the preparation of the "interim plan," a group of government experts led by Mr Hubert Curien, president of the CNES [National Center for Space Studies], examined the question of what means--especially budgetary means--would have to be deployed over the next several years to increase the national R & D expenditure to 2.5 percent of the GDP by 1985 (from 1.83 percent in 1980).

The findings of this group, which are the subject of a report that has just been published by the French Documentation Service, are subtended throughout by two concepts: a) The operating facilities of the state-owned basic research laboratories must be brought up to an indispensable level; and b) An industrial research and innovational incentive policy must be implemented to vitalize industry and confer on state interventions "a true multiplicative character."

Such a policy, according to the group's findings, must provide for a very rapid evolution, during the period 1982-1983, of the financing and implementation of public-sector research. They also recommend that development of basic research be continued while at the same time enhancing the incentive toward applied research, "the bottleneck of public research," and instituting a number of technological programs in new domains such as robotics, the biotechnologies or scientific

management of energy utilization and new energy technologies. Such orientations, which in some cases are already in place, will require, together with the "opening up of a greater public environmental research effort," a number of measures designed to increase by 6.5 percent in terms of volume the annual appropriations for personnel; increase by 50 percent over a period of 2 years the operations credits (namely, direct expenditures for research); double during the same period the credits allocated to the support and encouragement of research operations conducted jointly with industry; and implement the list of major equipment requirements drawn up by the Teillac report. Thus proposed are the creation of a vast research library in the human and social sciences, the building of a European transonic cryogenic wind tunnel, and the design, then the construction, of a large-scale French computer.

The situation of French industrial research is a matter of serious concern, according to the findings of the group. With a commitment of Fr 30 billion to this sector--1.1 percent of the GDP--France's effort will rank below that of the United States (1.6 percent, the FRG (1.4 percent), Great Britain (1.3 percent) and Japan (1.3 percent). From this, "It is clear that the objective of committing 2.5 percent of the GDP to R&D expenditures by 1985 will not be attained satisfactorily unless French industry takes an active part in this effort (...)."

79.7 Billion by 1985

The reporting group deems that the effort to be deployed during the interim plan must center mainly on the nationalized enterprises, collective research (technical centers) and "associative research" by way of which enterprises and laboratories cooperate. More generally, it stresses that a substantial financial effort will have to be deployed throughout the period to June 1985, and an exceptional one in 1983. "We are aware," it states, "of the difficulties the budgetary actualization of this planning proposal may entail. But it is only at that price that a real improvement in the situation can be achieved and that the objective set by the government can be attained."

Hypothetically, it finds that a low annual economic growth rate of 3 percent over a period of 5 years would result in a national expenditure of Fr 79.9 billion (under 1980 conditions) in 1985, Fr 29.6 billion of which would be industrially financed (versus Fr 21.7 billion in 1980), and Fr 50.1 billion would be government financed (versus Fr 28.8 billion in 1980). Within these terms of reference, the national R&D expenditure in 1983 will require a substantial increase to Fr 65.2 billion. These goals are far from being to the liking, in particular, of the budget management office, which, while recognizing the validity of these findings, expresses serious reservations as to the scale of effort the state budget can accommodate and the unbalance it would induce, particularly in 1983.

Disagreements Persist

Paris LE MONDE in French 25 Dec 81 p 8

[Article by Xavier Weeger]

[Text] The major provisions of the research program legislation will not be known

until early January, only 1 week from the "national proceedings" that, in the presence of the president of the Republic and the prime minister, will conclude the "national symposium."

Mr Chevenement knows very well what he would like to see provided by this legislation. But his views in this regard are far from being unanimous: An interministerial meeting on Tuesday evening 22 December at Matignon left no doubt as to the disagreements that persist between Mr Chevenement and certain of his colleagues and that are certain to have been included in the report on the discussion of those views that was submitted to the meeting of the Council of Ministers on 23 December.

These disagreements seem to center particularly on two issues: The Ministry recommends, first of all, that the main points of the terms and conditions of employment of research personnel be written into the legislation, rather for political, indeed psychological, reasons than for juridical reasons. The position being taken in this regard by Mr Chevenement's office, which is that this personnel should finally see it recognized that research is an "occupation" and should have more guaranties than are provided by their p.esent status as contract employees, is apparently not in the least shared by the Ministry of the Public Function and Administrative Reforms.

But--as can be easily imagined--budgetary problems are the main stumbling block. Mr Chevenement wants the legislation to include a mininum number of explicitly funded objectives, fixing particularly the overall sums and principal allocations of the research budget for the 5 years the program legislation is to cover. The Ministry, not without some good reasons, makes this a matter of principle... which the Finance officials do not want to hear about discussed.

The interministerial debate has, of course, only started. Not until after 6 January will things really begin to happen; but then, the decisions will have to be rapidly arrived at--by the first of February at the latest--if the timetable that has been set is to be met. "This promises us 1 month--January--of drawn daggers," say some ministry officials.

9238
CSO: 3102/102

STATE TO AID RESEARCH IN MICROELECTRONICS, BIOTECHNOLOGY

Frankfurt/Main FRANKFURTER RUNDSCHAU in German 5 Dec 81 p 13

[Text] The German federal government will help German microelectronics make a decisive breakthrough. Microelectronics, like communication technology and biotechnology, will constitute one of the focal points of Bonn research aid during the next few years. This was announced by Research Minister Andreas von Buelow. An allocation of DM 236 million is planned for coming years in the area of microelectronics, including special funds in the amount of DM 100 million designated for support of product developments. In the face of powerful Japanese and American development efforts in this field, Buelow sounded the alarm that German exports of technology intensive goods has stagnated in recent years while the import of such products has risen. With the new special program in microelectronics, which will receive DM 100 million per year for 3 years, competitive capability will be strengthened and jobs will be stabilized in the long term. Ministry experts point out, for example, that new machine tools will have a chance only if they have microprocessor controls; this is also true for new transmission technology in the data and communication fields. In the area of new technologies, the research minister is pushing not only for stronger cooperation between the firms concerned but also for greater involvement of the government and labor unions. The research ministry will increase the outlay for the biological sciences by 28 percent from DM 43 million (1981) to DM 55 million (1982). Buelow noted in this regard that biotechnology, including comprehensive work in the field of genetic research, could be for the 1990's what microelectronics is for the 1980's. Important leaps in knowledge have opened enormous longterm potentials for many-faceted applications in medicine, pharmacology, agriculture, chemistry, raw material production and environmental protection. As an application of biotechnology, consideration is being given to replacing animal experiements, which are encountering ever increasing criticism, by new methods from the area of cell cultures, for instance. Also belonging to biotechnology is research in the artificial production of important therapeutic materials like interferon which is being considered for cancer treatment. Buelow stressed that biological-science research will be brought together under a program of its own and supported on a broad basis. Presently, an intensive exchange of ideas is underway with the chemical and pharmaceutical industries concerning additional support measures.

9160
CSO: 3102/99

TRANSPORTATION

SAAB CONSIDERS CONTRACTING PART OF BAE 146 WORK TO FINLAND

Stockholm NY TEKNIK in Swedish 5 Nov 81 p 3

[Article by Sven-Olof Carlsson and Sverker Nyman]

[Text] Valmet hopes to take over about one third of Saab-Scania's production for the British Bae-146 feeder liner. Negotiations are underway and the Finnish side says that the chances of an agreement are about even. Valmet also stated that discussions are underway on Finnish subcontracts for other Saab projects as well, although Saab will not confirm this at present.

It is the production of rudders and ailerons that Valmet in Kuorevesi hopes to take over from Saab-Scania's aviation division in Linkoping, head of Saab-Scania's aircraft factory Juhani Makinen told NY TEKNIK. Eight metal workers from Valmet already are working in Linkoping to learn the production process.

If the deal is made Saab-Scania will give up production of the Bae-146 only. Saab is the legally responsible subcontractor. Saab participated in the design of the tail section (stabilizer and rudders) and spoilers. That occupied about 80 design engineers for almost 1 year and the work was completed some time ago.

This production corresponds to about 5 percent of the airplane's total value of about 110 million kronor. British manufacturers from British Aerospace are responsible for 55 percent of the plane's value and the United States is responsible for 40 percent (motors and wings).

Full-Scale Production

So far, British Aerospace has sold 13 planes to domestic American companies and has options on about 10 more planes, valued at 1.5 billion kronor. Full-scale production with three or four planes per month would employ 7,000 to 8,000 workers in Great Britain, 4,000 in the United States, and about 200 in Sweden at Saab. A subcontract to Valmet could mean as many as one third the number of jobs made available in Linkoping.

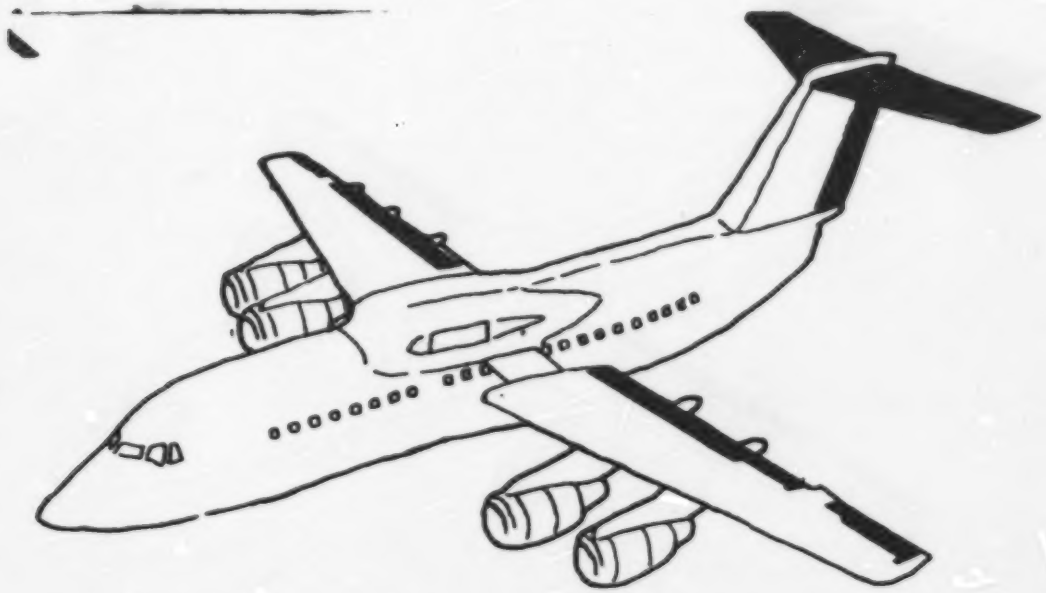
For Saab a transfer of production to Valmet would mean that more workers could be used for the Fairchild SF 340 project, the Viggen fighter, and production of the DC-9 Super 80, as well as assistance to a nearby future subcontractor. Saab and Valmet also have worked together for a long time to manufacture automobiles.

The problem for Valmet's aircraft factory in Kuorevesi is to obtain new orders by any means. By next year the factory will have delivered all 30 Vinka training planes ordered by the Finnish air force. Valmet developed this single-engine propeller-driven plane itself. This plane is a successor of a trainer the Finnish air force purchased from Saab in Sweden.

Empty Order Books

When Vinka production is complete only licensed assembly of the British Hawk will remain. The Hawk is a combined advanced trainer and light attack plane, most comparable to the older Saab 105. Hawk deliveries will end in 1985 and at that time Valmet's order books will be empty.

"We are also negotiating with the British for partial deliveries for British planes. We may also resume negotiations with the Soviet Union on partial deliveries for the MI-8 helicopter which now is used by Finnish border guards," Juhari Makinen said.



Valmet's aircraft factory in Finland hopes to take over the production of rudders and ailerons for the Bae-146 feeder-liner from Saab-Scania. Saab's overall share in the British four-engined jet plane also includes stabilizers and spoilers.

9336
CSO: 3102/95

VIEWS DIFFER ON CYLINDER DEACTIVATION FOR FUEL SAVING

Stockholm NY TEKNIK in Swedish 19 Nov 81 p 17

[Article by Jan Melin]

[Text] An automobile engine that runs on only two of four cylinders when low power is required can reduce gasoline consumption by up to 35 percent. This was reported by Alfa-Romeo, which is now testing such engines.

One system for reducing gasoline consumption in automobile engines is to allow the engine to operate on a portion of its cylinders when low power is required. Alfa-Romeo is now testing such an engine. It is an ordinary 2.0 liter four-cylinder engine that has been installed in ten taxis in Milan.

Each of the cylinders in the engine has separate fuel injection. A microprocessor measures and controls the fuel injection, the injection angle, the motor speed, and the radiator and air temperatures.

During low power output the processor deactivates two of the cylinders and allows the remaining two cylinders to operate. So that the wear will not be uneven, the processor changes cylinder pairs approximately every minute.

Poorer Response

The difference between driving on two cylinders and four is that with two cylinders the engine does not respond as well to the gas pedal, about like when the timing is slightly off. This was stated by designers at Alfa-Romeo.

It has been reported in Milan that in the present tests gasoline savings of 35 percent for city driving and 12 percent on the highway at speeds up to 90 km/h have been achieved.

General Motors has tested a similar system. Their tests were made on six and eight cylinder engines. One difference from the Alfa-Romeo tests was that General Motors did not alternate cylinder pairs, but allowed the same pair of cylinders to be deactivated during periods of low power output.

Electronics--Overconfidence

Saab's passenger car division in Nykoping said it is not interested in this technology.

"Perhaps there is some overconfidence in automobile electronics today," Hans Thornkvist of Saab said.

"To be sure, there are some possibilities for development in the area of electronics, but we are interested in developing the mechanical aspects, such as improved tires and reduced friction in the drive system."

Volvo in Goteborg is more secretive about its views on the Alfa-Romeo and General Motors tests. Volvo will not say whether it has tested, will test, or is now testing engines in which the cylinders are deactivated during periods of low power output.

CAPTION

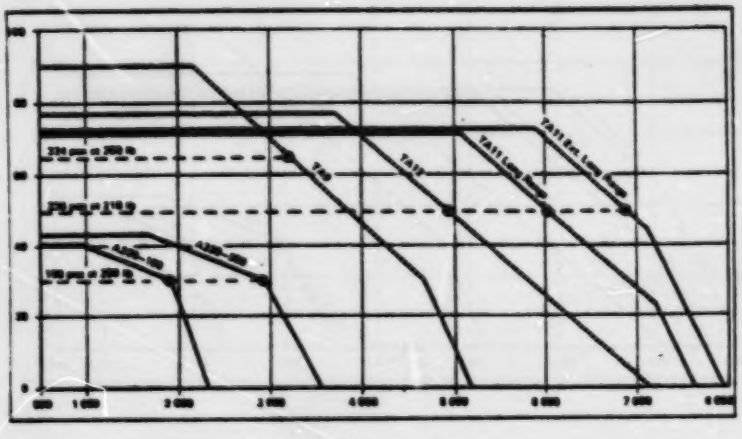
The difference between driving on two cylinders and four is that with two cylinders the engine does not respond as well to the gas pedal, about like when the timing is slightly off.

9336
CSO: 3102/95

AIRBUS INDUSTRIE PLANS EXPANDED LINE OF PRODUCTS

Paris AVIATION MAGAZINE INTERNATIONAL in French 1-14 Jan 82 pp 26-27

[Text] Toulouse--At the very moment when Lockheed announced stopping the production of the "Tristar," Airbus Industrie submitted its future plans at Toulouse. Without equivocation, the European producer has decided to develop a line which covers all the commercial market from the short-medium range liner with 150 seats to the long distance liner with 4 jet engines. The order of priorities is still somewhat vague, but it is gradually becoming clear from the various statements of group leaders.



From the A-320, a short-range liner to the TA-11, a very long distance liner Airbus Industries intends to cover in the future the essential needs of the civilian market, as these diagrams mass/distance coverable indicate.

We report first what has been found out. The "small" Airbus, the A-310 is about to leave the assembly shop in Toulouse. The basic plane, the A-300B will be replaced beginning in 1984 with a new version, the A-300-600 the first models of which will be delivered to companies beginning in October 1984 (nevertheless a dozen standard A-300B remain to be sold).

Then, which is very probable, it is a question of starting a short-medium range liner with 150 seats, the A-320 (AMI [expansion unknown] No 816), delayed to obtain starting orders. Air France has already decided on it, a decision is expected from Delta Airlines in the first quarter of 1982. But if the American Company does not choose the European plane, Airbus Industries is ready to go forward with non-American orders, since from its point of view, the market outside the United States alone is important enough to make its operation profitable.

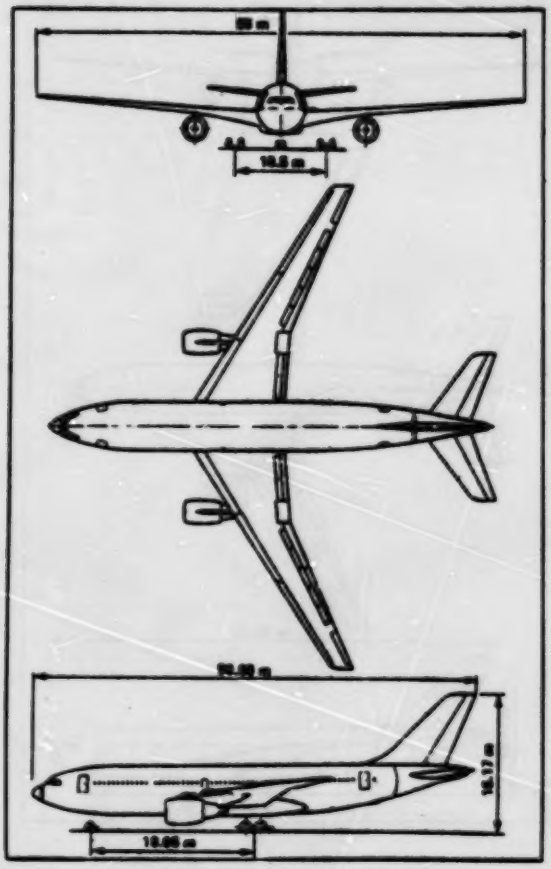
The big problem for the 150 seater is the availability of the engines. "We will not have a choice between three engines, but we will have at least one," Mr Beteille, the general manager of Airbus Industrie declared. He added: "we are confident we will have the engine we need in 1986." A statement which is intended as much to try and remove the doubts which exist about delays, as to indicate a desire not to dawdle with the program.

At the present time, 3 engines are contemplated, the CFM [expansion unknown] International (General Electric/Snecma) CFM 56-2000, the Rolls-Royce/JAEL [expansion unknown] (Japan) RJ 500-35, and the Pratt and Whitney/MTU [expansion unknown]/Fiat STF [expansion unknown] 633, all within the range of 24,000 to 25,000 pounds of thrust (10,886-11,340 kilograms thrust). On the technical level it is difficult to form an opinion about these various proposals so close as regards performance. In turn, one or the other is pictured as having the lead. What is certain that Rolls Royce, seriously affected by stopping production of the "Tristar," is going to concentrate its efforts to make its bid succeed. What seems probable, taking into account market prospects, risks and investments is that once a decision has been made, new associations will be formed on the level of the three large companies: CFM International, Pratt and Whitney and Rolls-Royce. What is also very probable is a delay of a few months which will lead, in fact, to putting the A-320 in service for the 1987 season.

Besides the A-310, A-300-600 and the A-320 three other plans are being studied:

A medium range twin jet liner with a very high capacity (350 seats in a single class) capable of covering 3,200 nautical miles (5,900 kilometers), the TA-9 (Twin Aisle-9);

A twin jet long-range liner capable of transporting 253 passengers in a similar arrangement over a range of 4,900 nautical miles (9,065 kilometers), called the TA-12;



The TA-12, twin engine long distance liner will be able to transport 230 to 250 passengers according to the arrangement, with a distance of 4,900 nautical miles between stops.

And finally a very long-range, four jet liner, with the same capacity as the TA-12, but able to cover 6,000 nautical miles (11,100 kilometers).

These 3 planes are based more or less directly on the A-300 and the A-310 and are to have in common a single wing surface of 320 square meters, representing an extension of 9.5.

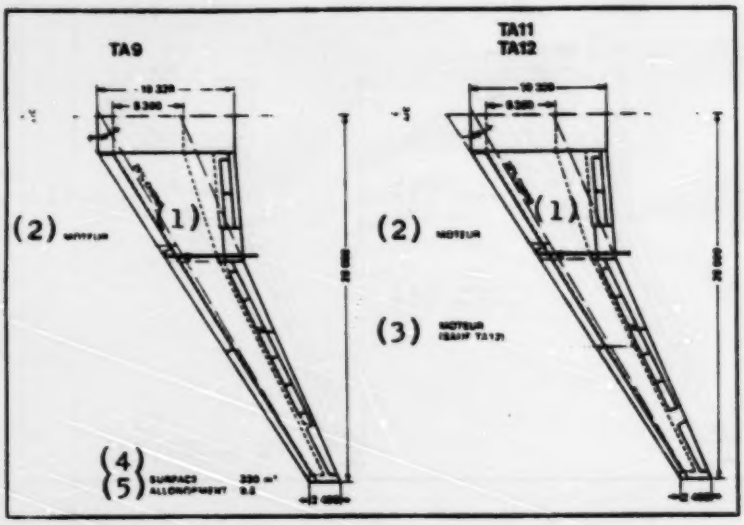
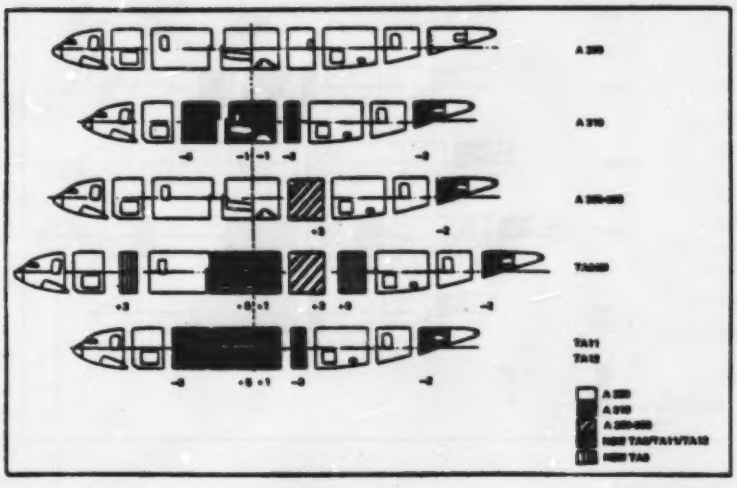


Diagram of the common wing assembly of the Airbuses: On the left the twin engine model (the TA-9), on the right, the four engine model (tne TA-11).

Key:

1. Chord
2. Engine
3. Engine (except TA-12)
4. Surface
5. Extension

Airbus Industrie, imitating Boeing, thus envisages creating a "basic design" which allows it to cover the broadest possible range of the market.



Based on the present A-300 fuselage, here are the models which Airbus Industrie is to develop for its various programs.

Alongside of these future projects which would have to run for the next 10 to 15 years, according to the outlets which the market will offer, Airbus Industrie intends to follow a policy of continuous improvement of its products.

Beginning in the next few years, test flights are to begin with rear centering on the A-300 No 3 which is now flying with the first cathode tube instruments. Flights with a centering of 42 percent of the chord have already been made. It is now a question of going to 45 percent in some flights. If, as those responsible for the test flights hope, the plane proves to be pilotable manually, a rear centering of 45 percent will be adopted on the A-300-600 and the A-310 when cruising. This centering will be obtained by transferring fuel in the tanks located in the horizontal plane of the tail unit. The advantage of this solution lies in a change of the plane's attitude in flight making it possible to reduce the tail's swerving and consequently to

reduce the compensating drag, which will improve fuel consumption. Piloting will be done with an automatic pilot, but the plane will remain pilotable manually long enough to make a reverse movement to return to a centering where the plane is naturally stable.

These projects should lead to two further developments. This method will be used first on the A-320 in a more complete manner, that is to say, that with the plane flying in an astable condition, the fin surface can be reduced, resulting in gains on the plane's drag and mass, with it all being piloted by electric flight commands. Then a version of the A-310 with an increased range is contemplated. Called the A-310-300, this version would have a range of 3,500 nautical miles (6,475 kilometers), would fly with a centering of 45 percent and would include fuel tanks on the horizontal plane. The solution will obviously be used again for the TA-9 and the planes which follow.

On the TA-9, for example, the combined effects of the solution will result in a fuel economy of about 2.5 percent.

8490
CSO: 3102/105

BRIEFS

BRITISH HIGH SPEED TRAIN--London--First commercial trip of the British TGV /Very High Speed/ train--the British TGV, the APT /Advanced Passenger Train/ made its first commercial trip on 7 December covering the 641 kilometers between Glasgow and London in 4 hours 14 minutes, at an average speed of 163 kilometers per hour. On the trip out the train arrived 1 minute ahead of schedule in the London station, after having reached 219 kilometers per hour at one point. The return was less triumphal: it arrived in Glasgow one-half hour late, because of defects in the inclination system, which is the most original feature of the APT. This device actually allows the train to lean on the many curves of the British railway network, until now an obstacle to increasing the speed of trains in Great Britain. Three times during the return trip, the defects in the inclination device caused a mini-panic among the passengers, overturning meal trays, spilling drinks and slamming the electronically closed doors. The APT project goes back to 1966, but the "BRITISH RAIL" budget delayed its completion. The passengers were delighted with the gain in time (an hour and a half over the regular train), but some found the APT uncomfortable. On 9 December, the APT had new technical breakdowns: it had to stop in the very middle of the Glasgow-London trip because of brake problems. The passengers were transferred to the regular train and the return trip was cancelled. /Text/ /Paris AFP SCIENCES in French 10 Dec 81 p 41/ 8490

CSO: 3102/105

END

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12 February 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 91

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WORLD INTEREST IN NEW VERSION OF SWEDISH DNA MACHINE

Stockholm NY TEKNIK in Swedish 3 Dec 81 p 12

[Article by Erland Rost]

[Text] One of the world's most advanced machines for producting artificial genes--synthetic DNA--is being presented at the medical meeting in Alvsjo. Hybrid DNA for the production of sour milk, insulin, and various hormones can be produced at the same time.

The machine was presented at the beginning of the year by KabiGen and can synthesize nucleotides, the building blocks of DNA molecules, but it has now been developed considerably further.

The ABC-80 computer that guides the production process can now handle four processors at the same time. And the software has been made so flexible that each user can "customize" his own process.

It was Bengt Noren and Gunnar Pettersson who, together with Analysis Technique, Inc. of Vallentuna, produced the new version. KabiGen is still in the picture, but now as a machine customer and a partner for cooperation in the chemical engineering area.

Nothing Better

Gunnar Pettersson says:

"Since we were in on it from the beginning and produced the machine, we venture to say that not even the Americans have anything better right now. The demand for this type of synthesis equipment is enormous. What the machine makes is a DNA fragment for producing genes. Those bits of DNA are joined with the genes of bacteria which can then be made to produce insulin, for example. The entire biotechnical industry can use this type of machine for producing the "parent substance."

Production on a larger scale does not require a larger machine. Not much parent substance is needed to produce a large quantity of a certain material. More or less in the same way that not much rennet is needed to make a lot of cheese.

Just as sour whole milk is used to make more sour whole milk, so the production of the parent substance is a one-time thing.

Gunnar Pettersson says: "So it is important to be in at the start of biotechnical production. But there will also always be a need for new parent material."

The new machine, which will be marketed under the name of Nucsyn, will fit on a laboratory table and operates with the help of 10 pneumatically regulated valves which, through a sophisticated arrangement of pumps, pour the right substances in the correct sequence into a reaction vessel. The computer controls the valves and the flow. The reaction vessel is in the shape of a small column 10 centimeters high. It contains a silica gel--a so-called solid phase--in which the molecular components are built up.

The new synthesis machine is therefore suitable for both laboratories and processing firms. A machine has already been sold to the Wallenberg Laboratory in Uppsala. The machine is on display at the medical meeting in Alvsjo.

11798
CSO: 3102/121

BRITISH-JAPANESE COOPERATION AGREEMENT IN ELECTRONICS

Copenhagen DATA-NYTT in Swedish 16 Nov 81 p 11

[Text] ICL (International Computers, Ltd.), the British computer firm, has announced that a comprehensive cooperation agreement has been reached with one of Japan's largest computer manufacturers, Fujitsu. What exists now is a basic agreement that will be followed by detailed negotiations concerning the final contract.

For the ICL, the agreement means that it will have direct access to the highly advanced Japanese technology in integrated circuits without having to go through a laborious, time-consuming, and expensive research program of its own.

It is the ICL's main product, the Series 2900, that will benefit from Japanese components in the immediate future. That series currently consists mainly of the 2946 and the 2966, which have a capacity of 0.3 and 1.3 MIPS (million instructions per second) respectively. The ICL plans to present a new machine in the 2900 series in November 1981. The model designation will be 2988, and it will come in two versions: a single processor with 2.2 MIPS and a double processor with a capacity of 3.5 MIPS. Delivery date for the 2988 will probably be around the end of 1982 or the start of 1983.

ICL Aims High

The ICL shows a more open attitude toward its future product development than most other computer firms. The usual industry practice is to give out no advance information at all before the product is officially introduced on the market. The ICL, on the other hand, provides clear information on what it has in its "pipeline" (although, to be sure, it does not tell all, but provides only selected information). Further development of the 2900 series will be based on the components that Fujitsu will be able to deliver. It is stated, for example, that the intention is to use the CMOS technique not only--as now--for storing data but also for performing logical operations. This will be done by a very small, inexpensive computer with a capacity of about 0.8 MIPS that is expected to be ready for delivery in 1984.

The ICL is also going to produce quite large computers. It already has plans for a computer in the 2900 series to be delivered to customers who have outgrown the above-mentioned 2988. The size of the 2988's replacement is given as 7 MIPS. A little further in the future--perhaps by the end of the 1980's--the ICL's designers see a "supercomputer" which will produce 15 MIPS in its basic version but which, as a

multiprocessor system, will be able to handle a load of 50 MIPS. That is impressive, to say the least.

Wider Range of Equipment

Cooperation with Fujitsu will do more than give the ICL access to Japanese components. The British company will also add new products to its line.

What that refers to is Fujitsu's IBM-compatible computers, which are said to have a very competitive cost-performance ratio. With those in his sample case, the ICL salesman will have a complete range of network-oriented computers that will obviously make it easier to face what has so far been very troublesome competition from IBM.

"We Know Where We're Going"

The agreement with Fujitsu is the first big step taken by the ICL's new management (which took over early last summer) to reverse the unfavorable profit trend: a sharp drop in profits during 1980 and large losses during the first half of this fiscal year. A couple of months ago, negotiations with one or two American computer manufacturers had reached an advanced stage, but they led to nothing. In commenting on that, the ICL said very clearly that that phase in no way excluded discussions concerning cooperation with other firms.

ICL spokesmen say that the agreement also shows recognition of the fact that access to components of the highest quality is necessary for continued product development, which in turn is a prerequisite if the ICL is to be regarded as a first-class supplier by the market.

Robb Wilmot, head of the ICL, claims that the agreement with Fujitsu is an important cornerstone for building up the new ICL: "We know where we're going, and we also know how we are going to get there!"

11798
CSO: 3102/107

SIEMENS INTRODUCES NEW LARGE-SCALE COMPUTER

Leinfelden-Echterdingen DIE COMPUTER ZEITUNG in German 2 Dec 81 p 1

[Text] With the new large computers 7890 and 7892, Siemens is bringing an even higher level of performance to its 7800 system. The 7892, now the largest model, has 15 times the capability of the smallest 7865-2; that means, user tasks can expand in a broad range and investments already made for software and peripheral equipment can continue to be fully utilized. The first 7890/92 computers will be delivered in spring 1983. Marketing will be in the most important markets in Europe.

With the announcement of the new units Siemens wants to underscore its continued cooperation with Fujitsu and at the same time clarify its role as the leading European supplier of compatible large-scale computers. Thus, to date, over 50 units of the 7800 system have either been installed or ordered. They operate both in the BS3000 operating system and also in the MVS, VM/370 and VS1 operating systems. The new 7890-7892 models can be operated with the MVS/SP V1 and V2 operating systems and the VM/SP Release 2 by the main competitor.

The 7890/7892 large-scale computers are distinguished by further improvement in the cost-efficiency ratio and by a maximum of safety. The model 7890 monoprocessor provides 2.1 to 2.5 times the performance of the 7880-2 model, so far the largest monocomputer in the 7800 system. The main storage capacity ranges from 16 to 64 megabytes.

The model 7892 multiprocessor likewise offers 2.1 to 2.5 times the capability of the model 7882-2 multiprocessor which to date is the largest. The main storage capacity can be expanded from 32 to 128 megabytes. Both models can be equipped with a maximum of 64 channels with an overall processing rate of up to 96 megabytes/second.

The high program capacity of the 7890 and 7892 models is achieved among other things by the three-stage storage hierarchy--main storage, nonlocal storage buffer storage and local buffer storage. An especially efficient jump instruction control decisively improves pipeline control. Distributed microprograms for control of instruction execution and control of arithmetic operations cause extremely short access times to the microprogram memories. The current version of the BS3000 operating system (BS3000 E40) is being expanded by a number of functions which make operation easier and improve efficiency. Thus, with the addressing capability of 2 gigabytes real memory the entire main memory can now also be used for normal

page changing. It can contain the extensive code and the buffer and control blocks for input and output operations and the users' data fields. Apart from some exceptions, the expanded memory is available for all address spaces. By establishing much broader parameters for the likewise expanded Decision Manager System (DSM), systems with a high load can be optimized to a substantially better degree.

With the new software production "Advanced Virtual Machine" (AVM) Siemens offers the users of the 7800 the possibility of utilizing several operating systems in one computer at the same time. In particular, AVM permits users, who presently operate a 7800 system with an operating system made by the chief competitor, gradual problem-free transition to the BS3000. In doing so, the present operating system is operated parallel to the BS3000 with AVM. The VM/370, DOS/VS, VS1 and MVS operating systems can be operated together with the BS3000.

12124
CSO: 3102/112

NORWEGIAN FIRM FIRST TO PRODUCE LARGE LCD'S

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 22 Dec 81 p 5

[Text] As the first company in the world, according to information it provided, the Norwegian Norsk LCD Co in Drammen near Oslo can manufacture large LCD's. The largest LCD cells which have been available on the market to date are about 3 x 12 cm. On the basis of a new patented technology the Norwegian enterprise Norsk LCD Co sees itself able to manufacture cells up to 20 x 15 cm and 30 x 30 cm, respectively, and larger. In principle, there is no limit to the size. In a report from the Norwegian consulate general in Duesseldorf it is stated that only the production equipment would have to be adapted.

This opens up new and interesting areas of application for LCD's, including automobile dashboards, the most varied kinds of information boards for the public, as for example for public long- and short-distance transport, and as visual display for new generations of telephone equipment. In connection with the last example of use, numerous markets will be opened up when development of flat data displays is completed as an expansion of the array of products.

The first request which the Norwegian company Norsk LCD Co received had to do with the manufacture of an information board, about 3 square meters, for use in railroad stations. Such large information boards and digital and analog clocks are among the products of the first generation using the large new LCD cells. The product is in any event sufficiently developed to go into series production.

But meanwhile development has progressed. In the meantime prototypes of the second generation were developed. These include instrument panels for automobiles, airplanes, ships and machines. Norsk LCD Co has just begun cooperating with Sweden's Volvo Co in order to develop such dashboard displays for automobiles. Among other things the advantage of this new technology lies in the fact that both new as well as traditional functions can be accommodated by the panels.

The third generation is also being planned. The goal of this stage of development is to develop flat data screens. At present these devices are still in the experimental stage. Several experimental data screens have, however, in the meantime been delivered to the telephone authorities. The cooperation with the Volvo Co on the one hand, and the use of this new LCD technology in many new sectors makes substantial expansion of production essential. Thus, the Norsk

LCD Co decided to seek out cooperating partners. In this they are thinking of involving a third enterprise which has suitable production technology and capacity. Moreover, they are very interested in establishing the appropriate license to manufacture abroad. In this they are also thinking of the FRG. (Norsk LCD Co., Kjeldaastoppen, N-3073 Skoger, Norway).

12124
CSO: 3102/112

ENERGY

DANES DEVELOP SOLAR-POWERED WATER PUMP FOR THIRD WORLD

Copenhagen BERLINGSKE TIDENDE in Danish 23 Sep 81 part 3 p 1

[Article by Mogens Kofod-Hansen]

[Text] It was revealed yesterday that Danish engineers have reached an advanced stage in the development of a revolutionary water pump driven by solar power. The pump is expected to create new possibilities for land usage in tropical developing countries and now barren desert regions.

This was made known when the prime minister of Zimbabwe, Robert Mugabe, visited the Grundfos pump factory in Bjerringbro, Jutland. The pump's "fuel" is heat from the sun which is absorbed by sensitive cells. Mugabe demonstrated great interest in the project which is well suited to Zimbabwe's plans for development, which are highly dependent on alternative energy.

The solar pump is a purely Danish achievement. Several large international companies have worked with the same idea, but they have given up. The World Bank then asked Grundfos to continue its efforts and now these efforts are about to be crowned with success.

So far the company in Bjerringbro has delivered several hundred diesel pumps to Zimbabwe, where African farmers have taken over large areas previously cultivated by white farmers. Grundfos is expected to be considered to receive part of a 40 million kroner loan to Zimbabwe from the Danish government which is to be used for purchases here in Denmark.

The company believes that the government of Zimbabwe could become part of a joint project to cultivate enormous, previously uncultivated, areas of land. A model for this could be the gigantic project in which Grundfos is participating in Sudan's Gezira Province between the blue and the white Nile. There the largest centrally led farm in the world has been established and the Danish company has delivered 400 to 500 of the 2,000 pumps sent to Sudan.

With solar pumps such projects will be of even greater value to developing countries. The Americans are extremely interested in the Grundfos project and yesterday Mugabe was enthusiastic over what he saw and heard in

Bjerringbro. He also visited the Dandy chewing gum factory in Vejle which, along with a local company, operates a plant in Zimbabwe.

He was unable to visit Tvind, however, as announced yesterday due to a lack of time, but he hoped to meet in Copenhagen with representatives of the Tvind schools' organization Aid to Developing Countries from People to People, whose volunteer work in Zimbabwe he praised during his visit.

Yesterday evening the prime minister spoke to the Foreign Policy Society and today he will continue his journey to Finland.

9336
CSO: 3102/103

CLOSED-CYCLE-DIESEL-POWERED MINISUB FOR INDUSTRIAL TASKS

Rome RIVISTA MARITTIMA in Italian Dec 81 pp 35, 40-50

[Article by Giuseppe Puglisi]

[Excerpts] After 9 years of work, the "Phoenix," the first submarine in the world with a closed-cycle diesel engine, will submerge shortly in the Gulf of Gaeta. It will meet industrial requirements for underwater work, requiring boats with greater power and economy than boats with electric motors. Because it is capable of developing 12 knots submerged, with a 250-mile autonomy, it will, at the same time, make the old dream of a single engine for a submarine on the surface and under water come true.

The great innovation consists of the closed-cycle engine, which finally replaces the dual diesel-electric driving apparatus, which seemed, for a century, to be inherently characteristic of a submarine, because an internal combustion engine for underwater navigation always seemed to be something like squaring the circle, owing to the unsolvable problems created by the availability of oxygen and by exhaust. In spite of that, thought was given to a single engine from the very first boats, for which the real problem was not so much hull strength as it was propulsion, precisely in that submerged environment for which these underwater means were designed.

It was learned that the obstacles encountered in these last 6 years were considerable. It was not a question of replacing atmospheric air with oxygen from cylinders, but rather of inventing a new engine that, among other things, would use carbon dioxide in place of nitrogen from the air.

A Conventional Diesel and a Closed-cycle Diesel

We shall speak of a closed-cycle diesel, but, strictly speaking, we should say semiclosed-cycle. A diesel engine is closed-cycle when its exhaust gases are recycled and are all returned to the intake of the engine itself. It is semiclosed-cycle when a small part of those gases are discharged into the sea.

Fuel Supply and Recycle

The schematic diagram of the engine of the "Phoenix 1350-1250" [at end] (a modified FIAT Alfo 8361 M engine, generating 130 horsepower at 2,250 revolutions per minute) can give an idea of its operation. The author of the project, Engineer Santi, explained its principal concepts. In a closed-cycle engine, there is a gaseous mass,

consisting of the volume of the engine (cylinder dispacement), of the intake piping system and of the exhaust piping system. The volume of that mass of gas, circulating in the system, must remain constant, in order to keep the pressure constant in the entire circuit. On the surface, it starts out with the engine circuit at atmospheric pressure and this pressure is kept constant even under water. As diesel oil is injected and burned, oxygen is drawn from its tank (with a complex system of electronic analyzers, meters and computers). During combustion, the water vapor and carbon dioxide produced have to be recycled at every revolution. The water condensate is separated and is sent to the stabilization tanks, while the gases, cooled and washed, are sorted out: the unconsumed oxygen is sent to its tank and the carbon dioxide is put back in the circuit, as a diluent of the oxygen in the engine, as has already been said. In conclusion, the exhaust is not expelled, otherwise it would be necessary to compensate for the weight with seawater. The submarine starts out with a given dispacement, consumes fuel and oxygen and returns under the same conditions, with secondary products on board, or, rather, with water, because the excess carbon dioxide has been expelled.

Exhaust Like Soda Water

There is, in fact, a small excess amount of gas that has to be expelled, a difficult problem, because the exhaust leaves the engine at the pressure of a tenth of an atmosphere and the greater the submerged depth, the more energy is required. At the maximum depth of the "Phoenix" (350 meters), the hydrostatic pressure is 35 atmospheres. Some researchers store this excess, in the closed cycle, by absorbing it chemically. In the semiclosed cycle, the Japanese say that they can pump it even from a depth of -100 meters. Engineer Santi discovered and patented a system that he has called the "mineral water" system, surprising, because with the same 5-atmosphere compressor, gas is expelled at a depth of 50 as well as 5,000 meters. Santi says that it is Columbus's egg, based on a principle of fluid mechanics and on a set of valves.

The gas to be expelled is introduced in a pressure-resistant tank in which it is dissolved, diluted in seawater brought in at outside pressure and then reduced to zero pressure. Once the gas has been absorbed, the water regains its previous pressure and is expelledinto thesea as "soda water." This explanation is rather sketchy and the picture is somewhat simple, but the system operates excellently. Water enters and goes out regularly without varying the weight of the boat and the stoichiometric relationship--proportional relationship of the components combined with each other--remains unvaried in the system.

The "Phoenix" Research Phase

These and so many other problems were identified over all these years and solved one by one in the Research and Development Section of Sub Sea at Zingonia with original systems and inventions, some of them patented, the result of months of designing, discussion, calculation, testing, disappointment, modifications, new tests. At another time, we shall relate how the constructive plan of the "Phoenix" was arrived at, phase by phase, and then we shall also mention those who worked and suffered, because designing is exciting, constructing is promising, but experimenting, modifying and testing again is tormenting and this will be mentioned in speaking of the birth of the first closed-cycle diesel engine. For now, we shall only say that, after numerous, lengthy bench tests of various engines, at Zingonia,

and then at sea, on the PH-XO2, for over 6,500 hours. it can be believed that the engine is a reality. These interminable hours of testing were what made us decide to make this preannouncement of the first submarine in the world that will sail with a closed-cycle diesel engine, although it it still in the construction stage.

We must explain what the PH-XO2 is. After the hundreds of hours of testing the first experimental engines at Zingonia, conducted in 1976, those results and that kind of testing no longer sufficed, because it was also necessary to test under water, to build a self-propelled underwater laboratory. The pressure-resistant steel toroid of the "Capshell." In 1977, modification of the experimental submarine PH-XO2 was planned and accomplished. Since then, all the new engines and components of the "Phoenix" project have been tested. The "Capshell" was not sacrificed for the PH-XO2, already part of the "Phoenix-66" project,[4] but some of its operational capabilities were added to those of the "Phoenix." Therefore the "Phoenix" became, in planning, a submarine with a hatch on the bottom for frogmen,[5] a "lockout submersible"[6] as they are called in international underwater terminology. The first tests of the "PH-XO2" took place in 1978, in the waters of Fiumicino (Rome) where the organizational base of Sub Sea is located and then in waters of the Gulf of Gaeta. These tests were constantly consistent with the tests in the Zingonia shops. Two years after those initial tests, the author of the "Phoenix" project pointed out, in October 1980, in an EEC conference in Luxembourg, the practical prospects for using the "Phoenix" submarine--now under construction at Zingonia--that could already be scheduled.

Sub Sea did not want merely a new engine, but also the entire engine-submarine system, to be used in its underwater work. The result is the "Phoenix 1350-1250" now at Gaeta. Once every kind of test had been determined, once change of the final engine model had been completed and perhaps checks had been made of the latest modifications of the entire system, suggested by the experience accumulated in those 3 years by the "PH-XO2," the executive construction plan was set up in July

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[4] The "Phoenix-66" project included extemporaneous incorporation of the "Capshell," with the frogmen inside, within the hull of the "Phoenix," for transportation and positioning of that capsule on the head of a oil well, where the frogmen would have to work to connect piping and valve rigging, while the "Phoenix" would carry on its work elsewhere.

[5] The minisubmarine USEL of our ship "Anteo" is equipped with a similar system, in its emergency model for rescuing the personnel of damaged submarines. See Tiberio Moro, "The 'Anteo' and Its Underwater and Rescue Components," RIVISTA MARITTIMA, April 1960, pp 34-38.

[6] The so-called lockout submersible system, created and carried out by E. Link in his "Deep Diver" (1967), eliminates use of the diving bell and the dangers associated with hoses and cables hanging from the support ship. The submarine takes the frogmen on board, without any pressure changes, from the decompression chamber of the support ship, takes them to the work site and there they exit on the bottom, attended by the nearly submarine, which provides them with everything they need.

1980. It was hoped to launch the boat at the end of 1980, but the higher safety margins that the company had imposed on itself, exceeding even the specifications of the Naval Register, lengthened the construction time.

The structural and operational characteristics of the "Phoenix" are given in table A [at end]. The leading ones are a speed of 12 knots submerged, 250-mile autonomy submerged and on the surface, 24 hours on the bottom to assist the frogmen. These characteristics are compared, in table B [at end], with the characteristics of electric submarines with the same displacement.

The "Phoenix" has a double hull, four encased propellers for positioning maneuvers (in addition to the screw). It is subdivided into three compartments, two at atmospheric pressure (control cabin and engineroom) and one at higher than atmospheric pressure for four frogmen. Altogether it can carry seven or eight men. It is equipped with instrumentation for transfer navigation, including the automatic pilot, communication system, target location system, work tool system, which includes an exclusive series of manipulator arms, of microclimate conditioners also for the frogmen. The bivalent engine works on air and in closed cycle, going instantaneously from surface operation to submerged running. All very easy, now, but 9 years were needed.

On the Gaeta Slipway

This "Phoenix" belongs to the first of three scheduled classes of submarines. It will be able to operate down to 350 meters, at present the maximum practical depth for frogmen (the simulated submersion record-holders go deeper). The submarines of the other two classes will be able to go down to 2,000 meters, with a release of frogmen down to a depth of -500. The medium-range (PH-2) submarine will be able to carry a maximum of 15 persons, and the long-range (PH-3) submarine will be able to carry 22 persons. Its autonomy will be 500 miles and 24 days saturation for its frogmen. In addition to that, in all three types, in case of breakdown, the crews will be able to have a 72-hour survival time by means of regneration of the microclimate.

The "Phoenix," now being fitted out at Gaeta, was designed and built in Zingonia, where we saw it in the spring, almost completed, in the preassembly phase, within a false hull, because the real one, made of steel, was being built at Taranto. Everything inisde had been "assembled," including control panels and main ballast and trim tanks occupying the space between the two hulls. Then it was disassembled and taken to Gaeta, where the same preassembly was performed again in a shed belonging to MARITALIA, this time within the long, steel large "cigar" of the real hull that had already been subjected to strength tests by lowering it to a depth of 400 meters. It was not finished. After welding the frames to the hull, in order to attach the various parts of the submarine to it, it was disassembled again and the empty hull was sent back to Taranto for polishing and annealing. Now fitting out is in process of completion. This is a patient and very critical task, because a large number of very strict inspections are being made in every phase of it.

Foreseeable Applications of the "Phoenix"

The future appications of the "Phoenix" in the field of underwater work will be determined after the sea trials. Some of chose application have already been

anticipated. Sub Sea knew what to require of its "Phoenix" when it designed it, because Sub Sea--although not the direct builder of submarines--already had previous expertise in them and also had made considerable modifications to the ones that it had acquired.

The "Phoenex" will have to perform primarily any kind of service rendered by electric submarines and all those services stemming from the availability of a larger amount of electricity produced on board by a 130-horsepower engine and those other services made possible by its complete independence from means of support on the surface. In assisting the frogmen on the bottom, in addition to supplying directly what a support ship can give them by means of the "umbilical," it will deliver electric power for their work equipment, including power for welding at a depth of 150-200 meters under water. It will also be able to operate small cranes and small water powerplants, bury underwater cables and so on. We propose to return to this subject, when the trials have been completed. For the present, let us point out that the company's old motto--"Others go under water, we work there"--takes on a completely different meaning. When the new engine works under water, it will open--it is no exaggeration to say this--a new age to science and industry, if man is really to search for other resources in the ocean. These new steel dolphins will, perhaps, be able to be the nuclear working submarine of poor countries.

Table A: Characteristics of the "Phoenix 1350-1250" Submarine With a Closed-cycle Diesel Engine

Length: 11.45 meters.
Beam: 3 meters.
Height: 3 meters.
Stern diameter of the pressure-resistant hull: 1.5 meter.
Bow diameter of the pressure-resistant hull: 1.9 meter.
Length of the pressure-resistant hull: 8.35 meters.
Maximum operating depth: 350 meters
Dry weight: 30 metric tons.
Displacement (submerged): 36 tons.
Maximum submerged speed: 12 knots.
Maximum surface speed: 7.5 knots.
Maximum surface autonomy: 24 hours.
Maximum submerged autonomy (in addition to the surface autonomy): 24 hours.
Engine power: 130 horsepower.
Oxygen load: 1,780 kilograms.
Fuel load: 960 kilograms.
Quarters:
  pilots and supervisors: 4.
  frogmen: 4-6.

[Table B on next page]

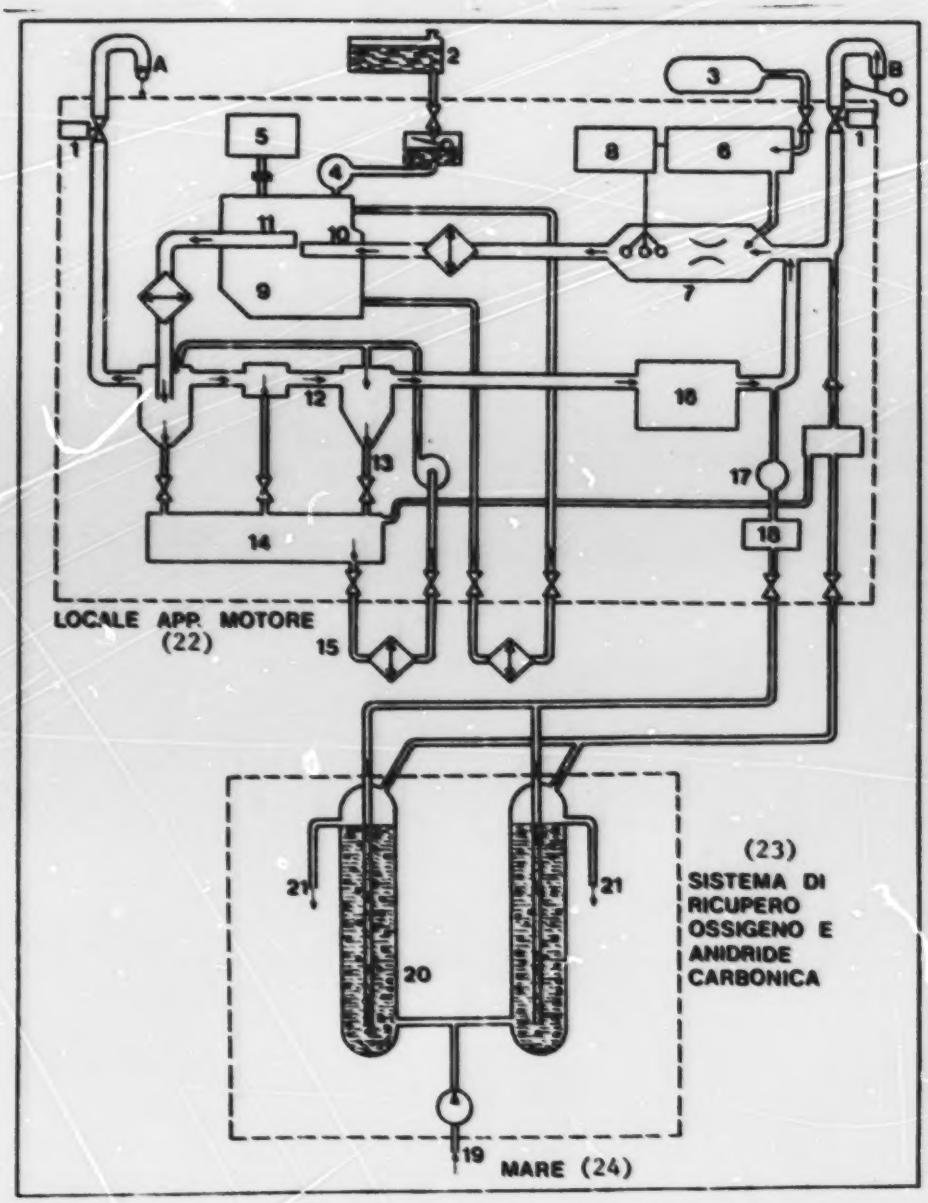
Table B: Comparison Between the Closed-cycle Diesel "Phoenix 1350-1250" Submarine and a Conventional, Electric-Battery-Driven Submarine of Equal Tonnage

	"Phoenix"	Electric Submarine
Furnished power:	130 HP	25 HP
Power density (with regard to weight):	7 HP/t	1 HP/t
Maximum speed:	12 knots	3 knots
Inspection time:	48 hours	8 hours
Frogmen, time on bottom	20-24 hours	4-6 hours
Quarters:		
pilots:	4	2-3
frogmen:	4-6	3
Comparative efficiency degrees		
a. Inspection work--time required:		
launching and submersion on the bottom:	1 hours	1 hours
work (h):	48 hours	8 hours
surfacing and recovery on board	2 hours	2 hours
energy resupply	4 hours	10 hours
Totals (H)	55 hours	21 hours
Efficiency ratio (h/H):	48/55 = 87%	8/21 = 38%
b. Release of frogmen (lockout): times taken:		
exit and submersion for work:	1 hour	1 hour
work (h)	24 hours	6 hours
resurfacing and recovery of submarine:	2 hours	2 hours
energy resupply:	4 hours	8 hours
Totals (H)	31 hours	31 hours[*]
Efficiency ratio (h/H):	24/31 = 77%	6/17 = 35%

[* sic; should read 17].

[Sketches on next two pages]

Schematic Diagram of the Bivalent Closed-cycle Diesel Engine
Under Surface and Submerged Operating Conditions



Key:

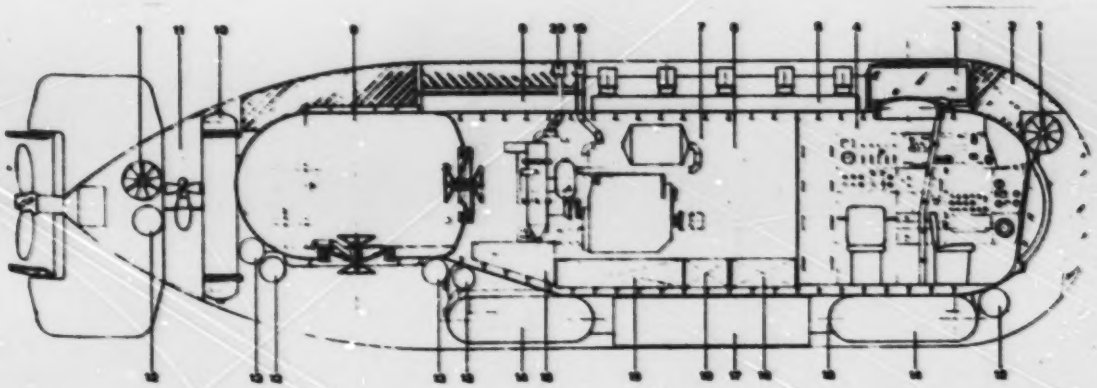
A. snorkel (exhaust)
B. snorkel (intake)
1. remote-control valves
2. fuel
3. oxygen
4. fuel pump
5. utilization charge
6. oxygen metering system
7. oxygen and recycled-gas mixer
8. oxygen analyzer and meter (computer)
9. diesel engine
10. engine intake
11. engine exhaust
12. water-gas separator

[Key continued on next page]

Key (continued):

13. exhaust gas cooling water circulating pump
14. exhaust gas cooling water tank
15. heat exchanger
16. recycled gas flow stabilizing tank
17. automatic bypass valve
18. excess gas compressor for exhaust to outside
19. seawater intake
20. seawater intake in pressure tank
21. exhaust of seawater and excess gas
22. engineroom
23. oxygen and carbon dixoide recovery system
24. sea

General Diagram of the "Phoenix 1350-1250" Submarine--Vertical Section



Key:

1. horizontal maneuvering screw
2. thrust material
3. telescopic turret
4. crew's quarters
5. transducers
6. lavatory
7. engineroom
8. waterpower distribution group
9. frogmen's quarters
10. oxygen recovery tank
11. vertical maneuvering screw
12. mercury tank
13. heat exchanger
14. trim tank
15. exhaust gas washing and compensating tank
16. compensating tank
17. solid ballast
18. oxygen tank
19. intake
20. exhaust

10,042
CSO: 3102/118

CHEVENEMENT TO PROPOSE NEW RESEARCH POLICY FOR FRANCE

Paris LE FIGARO in French 13 Jan 82 p 7

[Article by Aurore Molinero: "The Chevenement Plan"]

[Text] A colloquium, a law, and the means to apply it: In sum, these are the present and future concerns and occupation of Jean-Pierre Chevenement, minister of state for scientific research and technology.

Let us begin with the means. From the very start of the 7-year term and even a little before, the tone had been announced: The Cabinet meeting of 1 July 1981 had decided to increase the amount of money devoted to research and technological development to 2.5 percent of the gross national product in 1985 (1.8 percent in 1980), and Francois Mitterrand said at the Luxembourg Palace on 22 April 1981: "What place is France to occupy in international competition? First or last? Fifth place after the United States, the USSR, Japan or the FRG or out in front? (....) I have made my choice: Over the next seven years, I want France to be in the lead in science and I shall find the means."

Finding the means is all well and good, but do we have the means? And furthermore, what means are we talking about? They imply, according to a group of official experts meeting with Hubert Curien, president of the National Center for Space Studies (CNES), that an intense effort will be made in 1983. In short, 80 billion francs (in constant 1980 francs) instead of the 50 billion per year at present, this sum to be spent until 1985. Over the 5-year period, this considerable effort would be made by the government, but by industry as well, which will be asked to increase the amount of funds spent on research substantially, although a third would come from the government. (It should be noted that both nationalized and nationalizable enterprises represent over half of all industrial research.)

This effort aimed at the recovery of research and technology, the essential objective of the interim 1982-1983 plan, discussed by the National Assembly in December, has already been described. "The public research effort, based on a vigorous policy of recruiting research personnel -- which the interim plan said should increase at an average annual rate of 4.5 percent a year (3 percent in 1980) -- should move ahead and bring along the effort of the enterprises," the minister of research told the Cabinet on 6 January 1982. He added: "Considering the provisions made within the framework of the plan concerning the evolution of the other elements of the public budgetary effort, the civilian research and development budget should increase by 17.8 percent a year."

Model of Development

An increase of 17.8 percent is a great deal. Is it possible? The days to come should provide clarifications on this aspect since it is true that the somewhat contradictory discussions are far from over between officials in the Ministry of Research and those in Finance. It is also true that Jean-Pierre Chevenement would like the law on the programming and orientation of scientific research and technology to be the subject of objectives set in figures for the budgets over the next 4 years, which is far from being a unanimously held view on the Rue de Rivoli.

This law, which will be presented to Parliament for the spring session, should therefore be both an emanation of a political will, that of the government in power, corrected by the desires and fears expressed by a scientific community understood in the broader sense of the term. What will its contents be?

One of the prime objectives which the president of the republic set was to set up a "super ministry" of research in order to have better control of a scattered policy. For the most part, this has been done. It is all the more important, therefore, to define the idea that ministry has of research and technology in general. For it, they constitute a major political stake for France, one both cultural and economic, and it is a matter of accelerating the paths to a new type of development based on the organization of labor as well as on a new world economic order.

A cultural stake, first of all: "Rejection of knowledge is the characteristic of lost societies," Chevenement has written, and for him, knowledge and progress correspond to a collective need, whose satisfaction will finally reconcile science and culture.

Next, it is a means and tool of economic, social and industrial transformation: It is necessary to mobilize, upgrade, spread information.

Disseminate Knowledge

That is why it is necessary for the minister to initiate mobilizing programs — a notion that appeared during the regional meetings — following themes of great social or economic significance: social (and political also, moreover), with the objective, for example, of helping the Third World or fighting social inequalities; economic, with all that it implies with respect to new production techniques, recovery of the domestic market, and with the major technological fields (such as energy, materials, electronics, biology and transportation), considered to be factors of national independence and with, in short- and medium-range terms, the establishment of programs associating the research work and technological development of laboratories under different organizations, the CNRS [National Center for Scientific Research], engineering schools, universities, industries and technical centers.

This idea of having scientists and engineers work together for several years, with common concerns and using complementary techniques and approaches, is one of those to which the Ministry of Research is particularly attached. It goes somewhat in the direction of the second objective: upgrading research.

It is commonly known that the accumulation of knowledge in the major organizations is not always published outside of them or used to the maximum by industry and the economic structure as it should be, whence, among other measures, the substantial increase in the budget of ANVAR [expansion unknown].

The third objective is the dissemination of scientific and technical knowledge within a very broad public. Research workers are determined to come out of their shell, not only in order to express themselves, but also in order to help people to understand, to explain themselves and to explain to others.

In addition to all of this are other important supplementary orientations: having basic technical research, the leaven of the future, and endowed with substantial funds, without any a priori objective. "Creative originality cannot be programmed," says Francois Gros, president of the colloquium. It is also necessary to set up a policy of scientific employment and training of men for, but also by, research, a proper intellectual school. Finally, the French language must be refashioned in order to be a vehicle of scientific and technical thought.

This implies rethinking the policy of publishing these subjects for export in the French language. This also implies having media that can disseminate information in such a way that it can be exported. We are far from that still. Nor did the colloquium on the subject provide all the means to implement this policy.

11,464
CSO: 3102/113

FRG AUTOMOBILE INDUSTRY LOOKS TO CERAMIC ENGINES IN FUTURE

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 4 Jan 82 p 7

[Text] Eschborn, 2 Jan--The search for new forms of propulsion is not taboo for the German automobile industry, but the majority of manufacturers regards the replacement of current vehicle engines with a ceramic engine as a pipe dream. This is the conclusion reached by vwd [united industrial service], based on the results of a survey asking about the state of development in this area in the FRG, a survey conducted against the background of activities in Japan, where it is claimed that an all-ceramic, single-cylinder diesel engine, with no radiator, has been subjected to a long-term test.

In the industry there are more realistic estimates concerning the possibilities of using ceramics for particular engine parts, including the ceramic coating of metal parts. As an example, Porsche AG mentions coating exhaust valves, valve stems, valve guides or pistons. There is also research into whether exhaust manifolds, which are presently made of cast iron and, after the exhaust valves, are subjected to the most severe thermal stress, can be cast in ceramic and coated with aluminum. But even the Zuffenhausen company is not conducting a long-term test with a totally ceramic engine. The cost question is identified as the greatest difficulty, because no one is currently able to see how an all-ceramic engine can be manufactured efficiently. Porsche admits that fuel consumption could be reduced--although only marginally. The main reasons for the reduction are weight factors and the fact that the compression ratio can be increased by using temperature-resistant ceramics in exhaust valves or pistons, without reducing resistance to engine knock. Viewed over the long term, Porsche concedes that the ceramic engine has a chance, because the raw material ceramic will always be available in sufficient quantities, but a different metal used in automobile construction may perhaps no longer be available in sufficient quantities in the future.

The Bavarian Motor Works is also studying the use of ceramics in the engine. According to statements from BMW, higher processing and operating temperatures can be obtained with this material, which means higher efficiency. However, following the tests conducted so far, the company in Munich has concluded for the time being that there is still a very long way to go before a production stage is reached and it is highly unlikely in any case that anyone will start on this road in the next 10 years. Primarily, there are still technical problems to be overcome, because the qualities originally mentioned by the ceramics manufacturers have not yet been achieved at the levels promised.

Experiments are also being conducted at Daimler-Benz AG with ceramics in thermal energy machines, for example in the area of gas turbines. The Stuttgart company explained that everything is still unexplored territory in ceramics technology, with a number of "delicate points," such as combustion temperatures, load or material durability. Interestingly there was no concrete response to the question whether an all-ceramic engine was being run in a long-term test. It was pointed out that the company, for the first time, had shown a gas turbine engine with a ceramic rotor as an alternative form of propulsion, as part of the presentation of its research vehicle "Auto 2000" at the recent International Automobile Show in Frankfurt.

It was further stated that following the test runs the desired fuel consumption target "was close enough to be practical." Unfortunately, no method had been developed to mass produce this ceramics technology, the most important premise for high process temperatures and the low fuel consumption associated with it. The development of high-temperature-resistant ceramic turbine rotors was identified as the major difficulty in the construction of a low-consumption gas turbine. During the various test runs with the turbine rotors shown at the IAA International Automobile Show Daimler-Benz recorded temperatures up to 1,500° C and speeds of 60,000 revs/min.

Alternative materials are also being intensively investigated in the research department at Volkswagen AG. Intensive research work is being carried out into the use of ceramics in piston engines. According to statements from Wolfsburg, experiments using these thinner materials are being carried out to reduce the reciprocating masses of the engine, and consequently frictional losses. Some thought might also be given to positively influencing the combustion process and emissions through better thermal insulation.

At Volkswagen the combustion chamber of a diesel engine was thermally insulated with ceramic material to study these effects. The prechamber is made of aluminum-titanate, and the piston crown and the cylinder heads are coated with zircon oxide. Information indicates that the result with an induction engine is a basic redistribution of heat from the cylinder walls to the exhaust gases. In engines with an exhaust-driven turbocharger an increase in efficiency--even if a very small one--and smaller cooling surfaces could be achieved. According to the experts at Volkswagen, this insulation becomes really interesting where the secondary energy is utilized even more completely in analogous systems (as in a small steam process). Whether this will be a possibility for improvement in truck engines would again depend on how much the complexity and therefore the cost of the plant would rise in relationship to the attainable saving in fuel.

On balance the Volkswagen company confirmed that ceramic material was not a simple matter, because it was more difficult to control compared with conventional materials. Naturally the economic aspect also played a not inconsiderable role. It has been known for some time now that the Audi-NSU AG is testing ceramic linings and all-ceramic exhaust manifolds on gasoline and diesel engines with Rosenthal Technology AG. Another well-known German automobile manufacturer had "only a gentle smile" in response to the topic of the ceramic engine. As far as he knows, this Japanese "innovation" was apparently a "thimble engine," which could be suitable--if it was suitable for anything--for engines to power model airplanes or ships. In the view of this manufacturer, artificial ceramics would be unlikely to prove usable for larger engines.

9581
CSO: 3102/106

PROTOTYPE OF FINNISH-MADE MULTIPURPOSE ELECTRIC VEHICLE

Helsinki HELSINGIN SANOMAT in Finnish 3 Jan 82 p 28

[Article: "Domestic Multipurpose Monika Ready for Production"]

[Text] Turku--The domestic multipurpose Monika motor vehicle, intended for the transportation needs of outlying districts, has been manufactured in Uusikaupunki. The vehicle's designers and builders will come from the college of applied arts and technology.

The Teijo-delivery van has been used for the body of the Monika. The motor, axles, steering mechanism, control instruments, and a number of other parts are borrowed from Saab.

The project, which is supported by Sitra [Fund for the Commemoration of Finland's Independence], was started 6 years ago as an attempt to answer the question as to what can be done to meet the transportation needs of sparcely populated areas. The answer was simply an automobile.

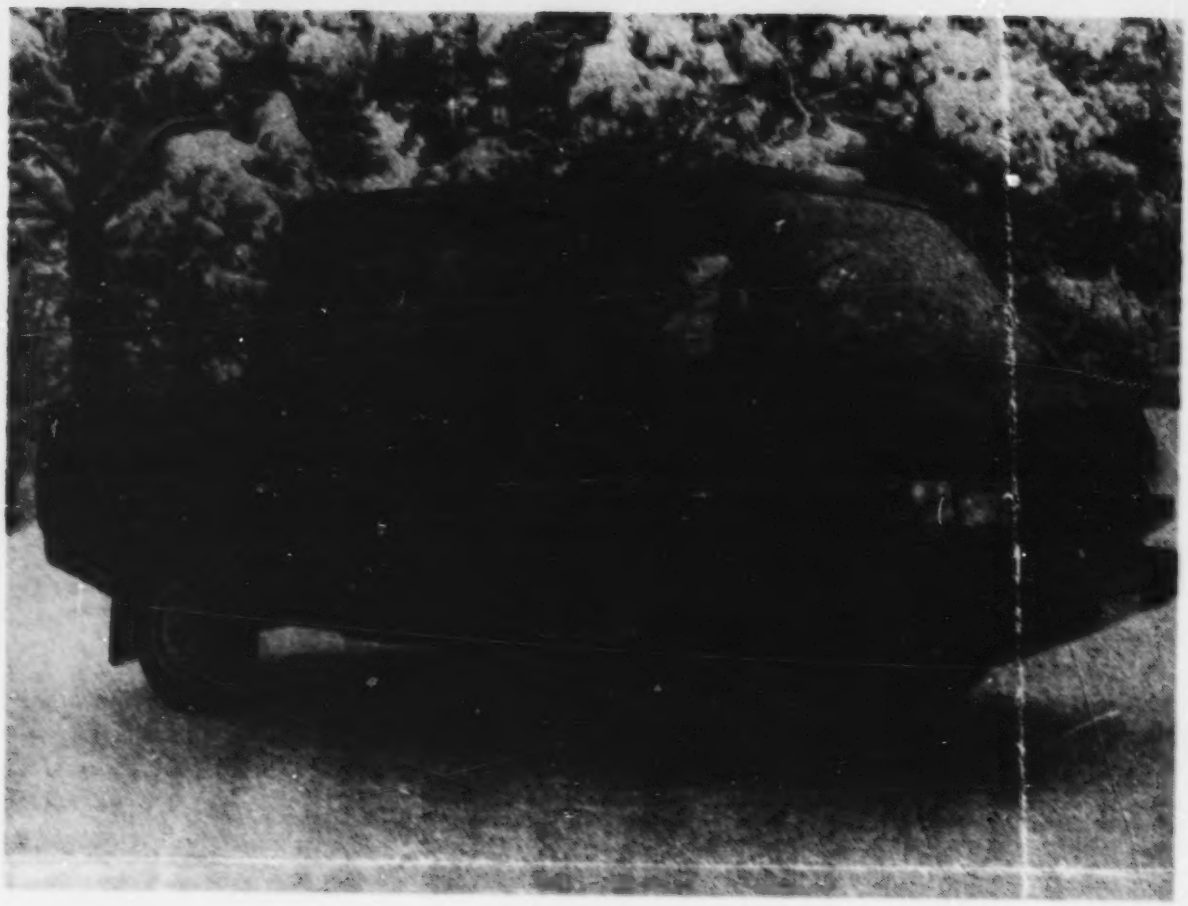
The project has been promoted by industrial designer Antti Siltavuori, and others involved in it have been Eero Miettinen and Markku Salo from the institute of industrial arts as well as Jari Anttila and Ari Lahteenmaki from the technical college.

The collection of information took place in the years 1976--1977, after which the basic concept of the vehicle was formulated to include a 4-6 passanger cab. The passenger section of the cab can be entirely converted into a cargo section if needed.

The fitting together of the vehicle's body and other parts was accomplished by means of practical experiments. The Teijo-delivery van was disassembled completely and the location of some of the engine parts had to be changed.

A Doppel-Cab as a Body Alternative

The so-called doppel-cab, whose passenger section can be converted into a flat bed in its entirety, was seen as the best alternative for the body of the vehicle. The bed's roof and side walls are stationary. A movable element, from which the back wall of the doppel can be obtained, has been concealed in the roof by tracks.



If needed, the passenger cab can be completely converted into a cargo section.

According to the design the rear window of the cab is also the rear window of the rear passenger section. Additional passenger seats are located in the wall between the forward cab and the passenger section.

The conversion of the delivery van into a six-passenger doppel takes only a few seconds. A tubular frame, which functions as a support structure for the fibreglass body, was chosen for the structure of the body. The front wall of the cab and the wall between the cab and the passenger section were made from a steel plate for safety reasons.

The dashboard is designed in such a way that all the controls and instrument displays are within the driver's field of vision and can be reached without stretching. The steering wheel, dashboard, and other control devices are adapted from the Saab-99.

The dimensions of the vehicle are built around the cab. The purpose was to to make the cab as suitable for passenger use as possible and to get away from the unergonomic upright clear position generally characteristic of delivery vans.

An attempt has been made to keep the outside dimensions of the vehicle as small as possible. Its length is equivalent to a medium-size passenger car and its width as well as the cargo facilities correspond to that of a medium-size delivery van.

The designing and construction of the Monika entailed 3 man-years. The vehicle is not on the market.

10576
CSO: 3102/96

NEW VOLVO TO MAKE DEBUT AT GENEVA SHOW IN MARCH

Copenhagen BERLINGSKE TIDENDE in Danish 6 Jan 82 p 9

[Article by Finn Knudstrup]

[Text] A new car from the Swedish automotive giant is just around the corner, although Volvo is reluctant to admit it officially. But the planners of the International Automobile Exhibition to be held in Geneva this March have made known that Volvo has ordered a rotating platform and large spotlights. In other words, the Swedes will exhibit something unusual.

Throughout 1981 Swedish newspapers presented drawings and spy photos of the new automobile, but the factory has refused to make public any illustrations or technical information. This is often the case, however, since an automobile manufacturer seldom is interested in making people "look forward" to a new car a year in advance. This would affect sales of the current model.

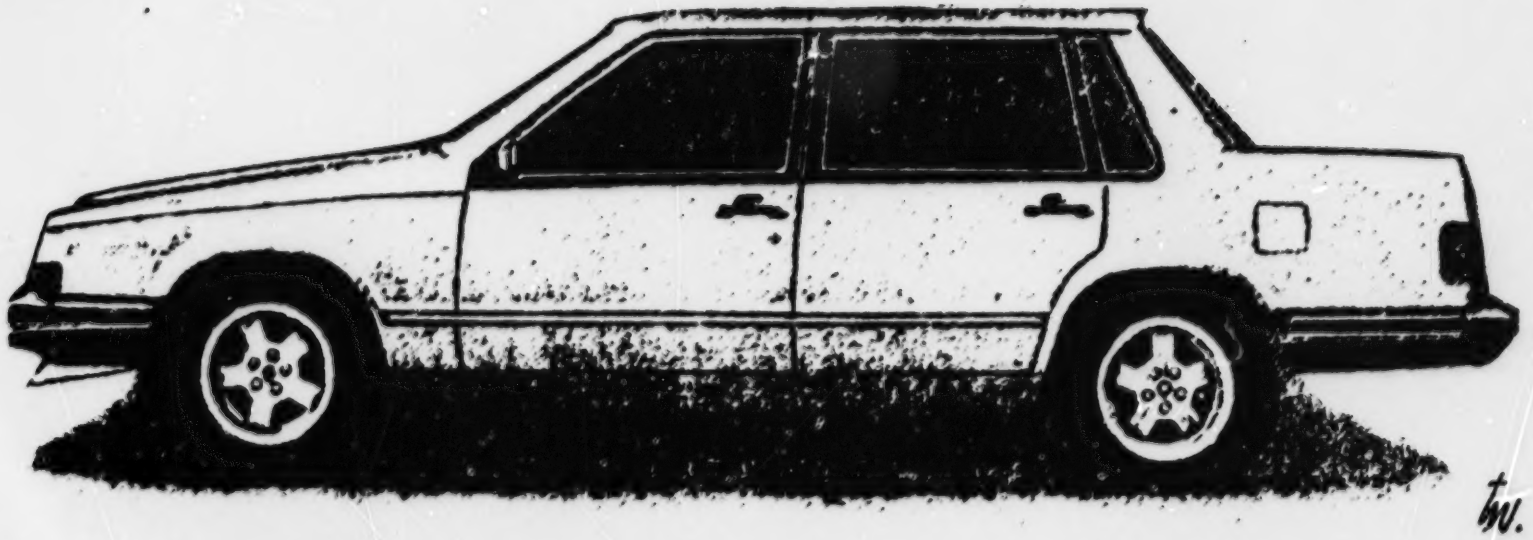
BERLINGSKE illustrator Tom Wikborg presents here his view of how the new Volvo will look. His background material is from the information and drawings that constantly flourish in Sweden. Now it is only a matter of weeks before the factory sends out the first official picture of the new car which is guaranteed to make its world debut at the Geneva exhibition.

More Economical

The car is still in the large class, but it is reported to be several kilograms lighter and equipped with a computer-controlled engine so that it will average well over 10 km/liter. Today the automobile giant produces cars that run only 10 and 11 km/liter.

The car will still have back-wheel drive, but recent Volvos have demonstrated good maneuverability with back-wheel drive.

It is also reported that the new Volvo contains much aluminum. Volvo's entry into the steel industry with its investments in Norway enables the company to use new materials. When Volvo entered the Norwegian metal



Artist Tom Wikborg based this drawing of the new Volvo on his impressions from drawings and spy photographs. It is believed to resemble quite well the actual car which will make its world debut in Geneva in 2 months.

industry it was reported that one of the purposes was to develop automobile parts based on aluminum. Since then Volvo has allied itself with Renault, with respect to both stock and automobile development, and Renault also has many plans for the future which may appear in the new Volvo, which was made economically feasible by Volvo's merger with the other large Swedish company Beijerinvest.

Volvo continues to manufacture its full-sized sedan because it is represented, in part, in the small car market by the 340 series produced in Holland, although for some time the 340 series has not been among the truly popular cars.

French Mini from Volvo

For this reason, since the beginning of this year, Volvo has been the Scandinavian importer of the Renault 5 mini-car, which now will be sold side by side with the Swedish and Dutch cars, beginning at 64,842 kronor.

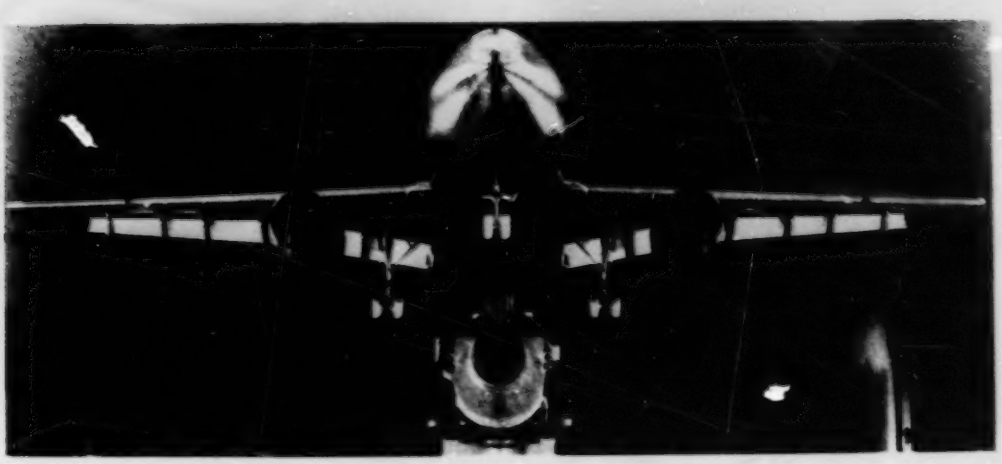
In this way Volvo has built an automobile program based on a mini, a midi, and a maxi and, in order not to destroy Volvo's chances of selling its own cars, it was decided that only the Renault 5 TL and TS would be sold. The 14, 18, 20, 30, and Fuego, as well as the completely new 9's will not be imported to Scandinavia, to the dismay of many automobile lovers. The new 9's have been declared "Car of the Year in Europe," while the Fuego was among the favorites for "Car of the Year in Denmark."

9336
CSO:3102/103

AIRBUS WIND TUNNEL TESTS PROMISE IMPROVED PERFORMANCE

Gelsenkirchen AEROKURIER in German Nov 81 p 1374

[Text]



The new A300-600 Airbus is already "flying" in the wind tunnel to everyone's complete satisfaction: Initial measurements in the German-Dutch wind tunnel confirmed good takeoff and landing characteristics for the future A300-600 Airbus. The 1:9.5 scale model, built for the Ministry for Research and Technology by VFW [Consolidated Aircraft Works] has a wing span of 4.5 meters and weighs about 1 and 1/2 tons. The landing flaps, clearly recognizable on the model, were developed jointly by British Aerospace and VFW. Compared with the previous A300, they will give the A300-600 better aerodynamic behavior, that means higher liftoff weight with the same thrust. Additional measurements on the model will be taken in the spring of 1982. The A300-600, which will be equipped with the most modern technological systems, will be delivered in 1984.

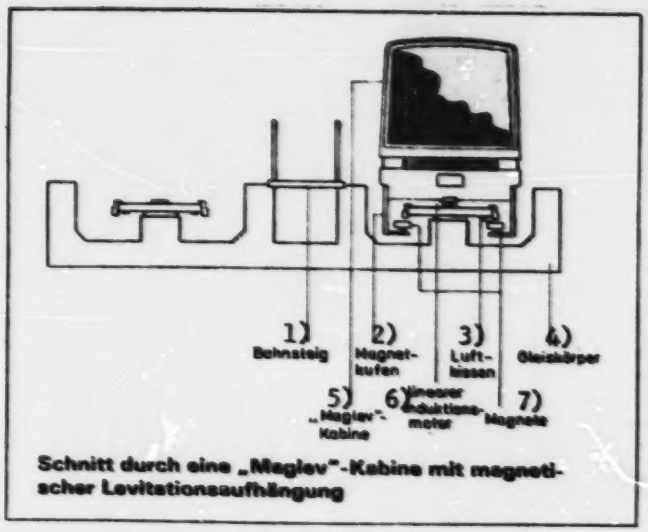
9581
CSO: 3102/106

BRITISH MAGNETIC LEVITATION LINE TO BEGIN OPERATION SOON

Wuerzburg ELEKTROTECHNIK in German 12 Oct 81 p 11

[Text] According to plans formulated in Great Britain, a magnetic levitation train system will soon be operating between the Birmingham airport and the nearby train station of the fair grounds via a 600-meter railroad line. In unmanned shuttle service, the individual cars will operate either in accordance with a fixed schedule or in accordance with demand. At the top speed of 42 km per hour, the trip takes approximately 90 seconds. An induction motor makes the cars--lifted and guided by electromagnets--move along their guide rail. The function of the wheels, springs and shock absorbers of conventional vehicle suspension systems is assumed by the so-called Maglev (magnetic levitation suspension), a contactless suspension and guidance system. Levitation magnets are placed at the four corners of each car. These magnets run below steel rails that lie on the T-shaped concrete rail and that are attracted by the magnets. The car thus is lifted off the guide rail so that it practically floats in the air. As long as the car is suspended, the magnets and the guide rail are separated by an air cushion 15 mm thick. At the stops, the car rests on skids, which in the event of a power failure during operation assume the function of an emergency brake. Levitation and propulsion require separate power-supply systems of 300 or 600 volt. Each system requires a set of power rails, since in contrast to conventional railroad systems the guide rails cannot be used as return lines. Each car contains a battery along with a generator, which provides power for the control and communication systems, the door-opening and closing mechanism and the ventilation and emergency lighting systems. At the beginning, the system will have three cars--one car for each line and one reserve unit. Each unit is 6 meters long and 2.25 meters wide and provides standing room for 35 passengers, including the baggage. Within the time span of 15 minutes, the system--operating with just two units--can transport 190 passengers in either direction. If necessary, it will be possible to run trains consisting of two units, in order to double the capacity.

Cross-Section of a "Maglev" Cabin Equipped With Magnetic Levitation Suspension



Schnitt durch eine „Maglev"-Kabine mit magnetischer Levitationsaufhängung

Key:

1. Platform
2. Magnetic skids
3. Air cushion
4. Railbed
5. "Maglev" cabin
6. Linear induction motor
7. Magnets

8760
CSO: 3102/81

BRIEFS

AIRBUS SALES EXCEED FIVE HUNDRED--Middle East Airlines (MEA) has placed firm orders with Airbus Industrie for five A 310 Airbuses, production of which will begin in the coming year, and at the same time taken out options for 14 of the small Airbus. An agreement to this effect was signed recently in Paris. This brings the number of orders for all versions of the Airbus above the magic boundary of 500 machines. [Text] [Gelsenkirchen AEROKURIER in German Nov 81 p 1372] 9581

FINAL ASSEMBLY OF A 310--Attachment of a wing and of the elevator unit marked the completion of assembly of the first Airbus 310 for Swissair in Toulouse (France). At present, work is in progress on the Forward Facing Crew Cockpit (FFCC) and the first tests (electrical system, oxygen, clocks and intercom) have been run. In regard to the question concerning operation of a A 310 with two or three crew members, Lufthansa's executive board at its session of 13 October confirmed its decision that the small Airbus 310 (210 seats; the A 300 has 253 seats) operate with a two-man crew, if it gets licensed--as expected--for two-man operation. Through its decision, the executive board acknowledged the present state of engineering, the latest test results--including the statements of the expert commission appointed by the U.S. president and the work-stress studies of the producer--and the possitive results obtained in operating aircraft with two-man crews such as the Boeing 737. [Text] [Duesseldorf VDI NACHRICHTEN in German 23 Oct 81 p 1] 8760

PLASTICS IN AUTOMOBILES--Together with industry, Great Britain's Ministry of Industry has invested 1.4 million pounds in a development project aimed at producing wheels, coil springs, and other vehicle components of plastic rather than metal. Backing the development project, which is expected to take 3 years, is a consortium made up of manufacturers and suppliers. Financial support is being provided by the Ministry of Industry's Mechanical and Electrical Engineering Requirements Committee. The substitution of plastics for metal has the advantage of reducing weight, with consequent fuel savings. The project is headed by the NEL (National Engineering Laboratory) in East Kilbride. [Text] [Helsingborg PLASTFORUM SCANDINAVIA in Swedish No 12, 1981 p 14] 11798

CSO: 3102/121

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JPRS 80133

18 February 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 92

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JPRS 80133

18 February 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

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ELECTRONICS

AEG TELEFUNKEN DEVELOPMENT CENTER FOR INTEGRATED CIRCUITS

Essen ELEKTRONIK APPLIKATION in German Dec 81 pp 21-22

[Text] AEG Telefunken has set up a development center in Ulm for integrated circuits which is available to the technical departments in all questions of microelectronics, both in an advisory and cooperative role. It is notable that the potentials of this development center are also offered to small and medium-sized firms. These firms can contract for the same or similar tasks as the technical departments.

The trend observed in recent years in microelectronics will doubtless continue through new technologies and circuit principles. A graphic illustration (figure 1) shows the movement of complexity and price of integrated circuits in the period from 1970 to 1990. It is expected that by the year 1990, several million components will be housed on one chip with a simultaneous reduction in price by more than 30 percent. This development also leads to a change in the classical production structure. Whereas it breaks down into component, assembly, subsystem, unit and system, today, large integrated circuits (uP) already have the character of assemblies or subsystems. For the component manufacturer it is thus tempting to move into the area of subsystems and systems and to produce his own microcomputers for instance.

In order to maintain his market position among component manufacturers, the unit and system producer must also have direct access to the potentials of IC technology in order to keep his units competitive in the market. In Europe this is often done today by purchasing or building semiconductor factories in the U&. However, usually the interests of the semiconductor factory cannot be brought into harmony with those of the equipment manufacturer, e.g. for development-intensive but low production work. Another possibility is to create internal design activities aimed mainly at supporting the system and equipment developer. This method was selected by AEG Telefunken with the founding of the development center (figure 2) for integrated circuits next to the existing semiconductor factory. This is not an external section of the semiconductor factory, but a center which stands with the equipment developers through product development in order to have optimal systems, regardless of production volumes, by means of integrated circuits.

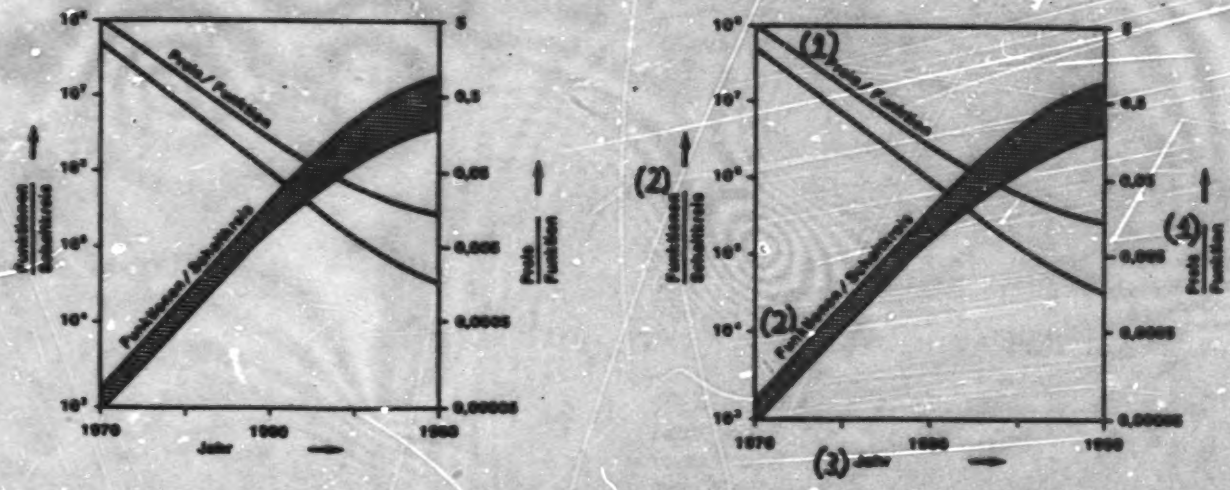

Figure 1. Complexity and Price of Integrated Circuits between 1970 and 1990

Key: 1. price/function
2. functions/circuit
3. year

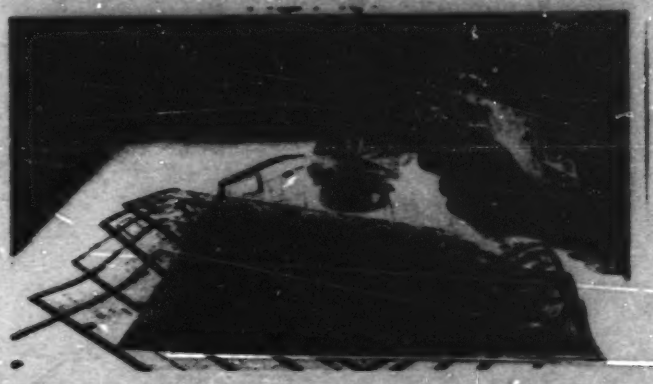

Figure 2. Checking Masks for the Production of Integrated Circuits at the Development Center for Integrated Circuits

Available to Others

The services of this development center set up in Ulm are not restricted to the company, but are also offered to small and medium-sized firms as neutral partners in handling questions on integrated circuits. For a fee, these firms can have the same problems worked through as the technical departments of AEG Telefunken. The employees of the Institute are obligated to treat research results confidentially even with regard to AEG Telefunken.

besides the development center in Ulm, there are other facilities in the FRG which cooperate with industry in a similar manner, but more in an advisory fashion: The VDI Technology Center in Berlin and the Fraunhofer Institute for Solid State Engineering in Munich. The development center works closely with these institutes and with others in foreign countries.

Customer-Tailored Circuits

The development of integrated circuits pertains mostly to circuits designed to customer specifications, or customer-tailored circuits. Emphasis is on product developments which contain all steps from circuit development of beginning of production according to a schedule established by the customer. The essential tasks are developments for later, small production runs. Such products are usually of no interest to a semiconductor manufacturer, since his development potential would be tied to problems which in the final analysis do not fill his production capacity. The semiconductor manufacture is interested in the production, and not in the pure development of components. Nonetheless, for cost reasons of reliability or power consumption or size, for example, an integration is unavoidable. In these cases it will be advisable to assign this task to the development center.

The problems of small industry having no know-how and without any guarantee of large production runs had no opportunity to have customer-tailored circuits. Since the development center offers development aid without guarantee of production volume, one of the existing problems can now be solved.

Figure 3. Highly-Integrated Miniaturized Radar System (Photo: AEG Telefunken)

Integration Required

A typical example which shows the necessity for integration of certain system developments, is a miniature radar system whose entire electronic system had to be housed on two modules of 16 mm diameter each (fiture 3). It consists essentially

of two linear and two digital integrated circuits, the latter in a complex I^2L design with 4000 transistors. In connection with a sending transistor and a receiving diode, the device measures the distance to an object on the basis of the Doppler effect. The digital circuits contain memory, digital filter and an evaluation computer which determines the shortest distance to an object from the linear, highly-amplified reception signal, and gives off a signal to a high-current output at that time. System testing was only possible with the system completed and for reasons of space, an integration was unavoidable here.

9280
CSO: 3102/128

ELECTRONICS

INCREASED GOVERNMENT FUNDING FOR MICROELECTRONICS

Dusseldorf VDI NACHRICHTEN in German 11 Dec 81 p 1

> [Text] Funding in the amount of DM 100 million will be spent in the coming year by the Federal Research Ministry within the frame of the special program in microelectronics. This money will be available for development of microelectronics in addition to the DM 136 million already approved. The VDI Technology Center in Berlin advised applicant companies of funds to be paid within the funding program.

In addition to an approximate 40 percent increase in funds for the development of microelectronics to DM 136 million, in 1982 another DM 100 million will be available from the Federal Research Ministry for the special funding program in microelectronics. As Federal Research Minister Andreas von Bulow acknowledged on 30 November, this program is intended to support primarily small and medium-sized companies in their competitive position and to secure jobs for the long term.

Product developments are promoted in companies of any size from all areas, from concept down to series-ready prototype. The workers at the VDI Technology Center in Berlin are occupied with the unfolding of the special program on microelectronics.

The future alignment of funds of the Federal Ministry for Research and Technology (BMFT) should be increasingly toward such technologies, according to von Bulow. Like microelectronics or biotechnology, these are key technologies which have positive effects on many sectors of industry. As the minister stressed, microelectronics would permit many solutions to urgent problems in the FRG of energy savings or pollution, for instance. The budget committee of Parliament took this into account by raising the budget for the BMFT for 1982 by 8.8 percent to DM 6.610 billion.

Additional funding of DM 280 million has been made available: DM 100 million for a special program on applied microelectronics, DM 150 million for iron and steel research, and DM 30 million for optic communications engineering. For energy research and technology, the forward projection budget was increased by 10.5 percent to DM 2.550 billion. Funds for non-nuclear energy research rose a surprising 22.7 percent to DM 761 billion [sic]. For nuclear energy research, DM 888 million and for energy research centers, DM 901 million has been set aside.

Von Bulow reported that he would undertake more intensive efforts to expand the innovation arsenal of the BMFT. The minister intends to dedicate particular attention to the problem of establishing innovative companies. This could mean chances for growth and jobs in future areas which would be too little used in the FRG. The translation of research results takes too long; we will have to be more effective here.

In general, von Bulow considers the development of new, overall strategies to be necessary to counter competition from the USA and Japan. It is important to develop new forms of cooperation between State, industry and workshop. State and business would have to cooperate pragmatically as in the USA or Japan.

9280
CSO: 3102/128

CURRENT WIND-ENERGY RESEARCH PROGRAMS REVIEWED

Brussels LA LIBRE BELGIQUE in French 5 Jan 82 p 14

[Article entitled "What is the Future of Wind-Energy?"]

[Excerpts] The firm HMZ (Hayen Maurice Zepperen), a family business located near St-Trond, has signed a contract for 1 billion with Wind Master Corporation of Carlstadt (New Jersey), for the manufacture and installation of 500 wind turbines with a power of 50 kW. In New Hampshire, windmills installed on farms are used to produce electricity. An all-new windmill has been designed for this purpose; it has a 20 meter wingspan.

This order is quite exceptional because it exploits a technology developed here in the domain of new energy sources; it also reveals the growing interest demonstrated in windmills throughout the world. In the present article, we propose to review some innovations in this field, and to outline the future of wind energy.

In the Garden of the Boss

The HMZ enterprise, which until recently manufactured agricultural machinery and farming equipment, converted to solar energy after a group of students from the Katholieke Industriele Hogeschool van Limburg had devoted a senior project to wind turbines. Two engineers who had participated in this project were hired by HMZ and got to work. After a while they built a prototype which was installed in the garden of their boss, Jos Hayen, and which provided power to heat his house.

The HMZ windmill obtains 46 percent of its power from the wind, while the competition averages only 30 to 40 percent. This higher yield is due to the wings, whose design is quite special since it makes use of the lift phenomenon which is so well-known in aviation: it involves the vacuum created behind an airplane wing.

The HMZ prototype produces 7.5 kW for a wind velocity of 7 meters per second. It is thus adapted to the Limbourg climate, where wind speeds are low. For the time being, the prototype is connected to storage water heaters in which power is converted to heat (95 degrees maximum) by means of resistors. The windmill offered by HMZ costs less than 450,000 francs.

One of the HMZ projects is a 150 kW turbine which will operate at the top of a 34-meter tower, and which is scheduled to be completed next year. Other, bolder projects in the works include another turbine, 85-meters high, whose construction is scheduled for 1984/85.

Zepperen is receiving an abundance of orders, and a new plant is under construction at the St-Trond industrial park; it will cost 85 million. The company's 1980 turnover was 270 million francs. Fifty employees were hired to join the 120 existing workers.

What is the situation with our northern neighbors? Actually it is rather disappointing for a country which, after all, has made the best possible use of windmills for a very long time.

In Zeeland, near the Belgian border, the regional electric power company, Pzem, which also owns the country's only nuclear power plant (477 megawatts), recently opened the first wind-power plant to supply electricity to the public network. Supported on an 18-meter pole, three 7-meter blades provide 55 kW with a wind of 5 meters per second. It is barely more than a pinwheel, whose output can service only some 50 dwellings.

Few other wind-power installations have been installed. On Terschelling Island (at the extreme north of the country), the Ecole Superieure de Navigation is operating a wind generator underwritten by the Common Market. South of Rotterdam, a harbor enterprise is using another windmill identical with the one in Zeeland.

One symbol of this dearth is without doubt the Petten wind generator, shackled by administrative paralysis. Its two 12.5-meter propellers should provide not only 300 kW, but also a wealth of figures on the characteristics of such an installation. But although its construction was decided in 1976, and even though it has already been run clandestinely, its placement in operation has been constantly postponed: its file has broken down somewhere between three ministries with "appropriate jurisdiction."

One can imagine the disappointment of the Dutch when faced with this shortage, as well as when they realize that the only wind-power stations offered on their market are manufactured in Denmark. A national conference organized recently about the prospects for this form of energy turned into a confrontation. As a result, and without any implied promises to the industry, the Dutch government estimates that by the year 2000, the wind will supply the Netherlands with 1500 to 2500 electric power megawatts, which is equivalent to the production of two nuclear plants.

Like the Cologne Cathedral

In West Germany, the first stone for a wind-power installation was laid in Schleswig-Holstein. It has been named Growian, an acronym for "grosse windenergianlage," which in French would be Grineo, for "grande installation eolienne" (large wind-power installation). It involves a construction with a height of 150 meters, capable of competing with the Cologne Cathedral. Installed at this height will be a rotor consisting of two 50-meter long blades. This rotor will

begin to turn when the wind velocity reaches strength four, driving a generator located at the top of the tower. This installation, which should become operational in the fall of 1982, will have a power of 3 megawatts. Built with the support of the Federal Ministry for Scientific Research, it should cost 70 million DM.

In order to cover all the energy needs of FRG from wind sources, 25,000 such installations would have to be erected throughout the country!

The discussion on whether to utilize wind energy began several years ago in Germany. The north of the country, swept by winds the year round, has an inexaustible supply, but even today, the discussion between the supporters and detractors of this natural energy continues, especially about the profitability of the necessary investments.

In 1973, experts had made preliminary calculations, and had concluded that the electric power derived from wind could be used for local heating. And while it is technically possible to integrate wind-generated power into the public network, the Germans believe that this is not yet economically efficient.

But this is not the goal of the Schleswig-Holstein experiment. The wind will remain a supplementary energy.

The Musgrove Machine

In England, the experts are more optimistic and in fact more advanced in their research. They estimate that one day wind energy should be able to supply up to 20 percent of the country's electricity needs, while also satisfying the electric power needs of small communities in many areas of the world.

Four British enterprises have thus joined forces in 1980 to perfect a new model. This group has received a 400,000 pound subsidy from the British government to undertake a study for the construction of a wind-power generator with a diameter of 25 meters, which will provide 130 kW. This installation will serve as a test bench for larger machines which are expected to be built later. These could have a diameter of 100 meters and a power of several megawatts.

The 25-meter prototype will be based on a turbine with a vertical axis and variable geometry, invented in 1975 by Peter Musgrove of Reading University, near London. He has already built machines of three and six meters in diameter, and will serve as consultant for the new project. As recognized expert and president of the British Wind Energy Association, he is also advising China on its wind energy program, at the request of the United Nations.

The Musgrove machine has vertical blades mounted at each end of an arm rotating horizontally on a vertical axis installed at the top of a concrete tower. Microcomputers will automatically regulate the blade angles as a function of the wind's variable force, so that the power generated will remain constant.

The prototype of this newly designed wind generator, which is already operating at Brembridge Fort, on the Isle of Wight, has a diameter of 6 meters and produces about 30 kW.

One of the characteristics of the 25-meter wind generator is that its turbine will be equipped with rotor blades made of composite materials, such as carbon or glass fibers. This gives them a life expectancy of 40 years, which is an appreciable advantage for systems expected to be installed offshore in groups of several units. Current plans envisage the location of these groups sufficiently far away to avoid esthetic infringements on the environment, and their connection to the national electric power distribution network.

According to the British company Aircraft Designs Ltd., a collaboration could be envisaged for the industrial production of this type of wind generators in the next few years together with Belgian aeronautics companies, among which SONACA, which already has an advanced experience in the production of composite materials.

11,023
CSO: 3102/110

ENERGY

FURTHER TESTING OF COAL CONVERSION PROCESS UNDER WAY

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 14 Jan 82 p 7

[Text] The United Electrical Generating Works of Westphalia AG (VEW) has now begun the second stage of testing of its coal conversion process, after having received approval for a DM 65 million grant from the Federal Ministry for Research. The planned coal gasification experimental plant, with a capacity for partial gasification of 10 tons of coal per hour, should go on line in 1984 at the Gersteinwerk powerplant in Werne-Stockum. Plans are to link the new installation, which will cost DM 130 million, into the powerplant process. The gas produced, as well as the coke by-product will be utilized as fuel in a 107 megawatt block.

The coal conversion process has been developed by VEW with the intention of converting coal to electrical energy in the most cost-efficient and ecologically defensible manner possible. The technical resolution of this problem has been demonstrated in the course of experimental operations over the past 3-1/2 years, using an installation with an hourly capacity of 1 ton of coal. The successor project will require a substantial technological outlay, for example, a complete gas purification that will reduce discharge emissions to the legally prescribed minimum. VEW expects to gain further positive results from the second experimental plant by 1985, so that the next stage, the erection of a plant with a 60 ton/h capacity can be projected. This unit is planned for hook-up to the 750 megawatt composite block now under construction at the Gerstein works.

VEW disclosed further that it has submitted a new application to the Land authorities in Duesseldorf for approval of the 1,300 megawatt light water reactor at Hamm and thereby reactivated plans for the project which were submitted in Duesseldorf as early as 1975. In addition, VEW expects construction approval from the Lower Saxony Land authorities for the first section of the block in Lingen by the spring of 1982.

VEW's chairman, Professor Klaus Knizia, expressed particular satisfaction at the federal government's recommendation, contained in the third renewal of its energy program, that additional nuclear powerplants, past those already on line or under construction, should be undertaken where required. The federal government's current awareness that nuclear energy must continue to make an even greater contribution to electrical supply production has been urged by electricity producers for more than 10 years. Without cost-efficient nuclear energy the raw material industry in the eastern Ruhr district would be continually and seriously weakened.

9878
CSO: 3102/131

WINKLER FLUIDIZED BED GASIFICATION TO ENHANCE COAL

Duesseldorf VDI NACHRICHTEN in German 18 Dec 81 p 1

[Text] As an alternative to oil as a raw material, the Rhenish Lignite AG (Rheinbraun) of Cologne, wants to demonstrate that the gasification of lignite on a large scale "can be a decisive step forward toward the enhancement of coal." This was the statement of Dr-Ing Peter Speich, member of the firm's board responsible for research and lignite enhancement, at the start of construction work for a synthesis gas plant in the Rhenish lignite area. The site at Berrenrath, southwest of Cologne, was chosen because it is located within a large and compact energy raw material reservation and because lignite's chemical and physical properties are especially suited to enhancement.

The first section of the pilot plant, which will employ the Winkler high-temperature process, was begun at this time after having accumulated experience since 1978 with a smaller 3t/h pilot plant. It is expected that, from 1984 on, some 37,000 m^3/h of synthesis gas will be obtained from a lignite input of 55t/h. A second construction phase, with 3 gasification reactors and appropriate processing installations, which will go on-line in 1988, should raise plant capacity by some 110,000 m^3/h of synthesis gas. By that time a gas plant, in which some DM 600 million will have been invested, will have been created, capable of producing approximately 1 billion cubic meters of synthesis gas, which will be transported over pipelines to existing plants of Union Rhenish Lignite Fuels AG in Wesseling, a branch of Rheinbraun, thereby replacing some half-million tons of oil.

Synthesis gas is a mixture of carbon monoxide and hydrogen, which the chemical industry uses as a raw material. Methanol and ammonia can be produced from it and it is also used in ore reduction. The gas from Berrenrath will primarily be processed into methanol, which can be used to power motor vehicles. The plant, when completed, will have a capacity capable of replacing some annual 200,000 tons of motor fuel.

For the operation of the Berrenrath gas plant, which will be designed and built by the Uhde firm of Dortmund, Rheinbraun will be able to make use of existing components of a briquet plant on the site. This includes preparation and drying facilities as well as the steam and electrical generating facilities for a mine powerplant. A gasifier will replace the briquet press. An enclosed industrial development site is also located there.

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CSO: 3102/131

BRIEFS

COAL GASIFICATION IN ITALY--A pilot coal gasification plant in Italy is planned by the firms of Nuovo Pignone and Franco Tosi Industriale, both members of the ENI-Group. The plant is intended to produce medium caloric gas on an industrial scale from Sicilian coal. A cooperation agreement was signed between the two firms, providing for the production of gasification and recycling boilers. The high sulfur content of Sicilian coal is expected to prove problematic. [Text] [Graefelfing ENERGIE in German Nov 81 p 344] 9878

CSO: 3102/131

SCIENCE POLICY

MEETING HELD TO DISCUSS IMPROVING TECHNOLOGICAL COOPERATION

Oslo AFTENPOSTEN in Norwegian 10 Nov 81 p 31

[Text] In spite of a series of meetings resulting in declarations of intent, it looks as if both industrial and research cooperation between Norway and West Germany are in the doldrums. The West German industrial leader Rudolf von Bennigsen-Foerder recently expressed the opinion that industrial cooperation between Norway and West Germany was sluggish and going badly. As for research and development, it seems as if the meetings in Trondheim over the weekend between Industry Minister Jens-Halvard Bratz and Andreas von Buelow, who is director of the Department of Research and Technology, have yielded no concrete results.

In a press release from the meeting it was said that the two ministers have continued the discussions on German-Norwegian technological cooperation. The ministers examined status reports on current projects and discussed forms of continued cooperation.

Neither of the two ministers, however, could comment further in a press conference Monday on which firms would take part in research cooperation. Both sides also seem uncertain about how much money should be invested in this area.

Minister Bratz emphasized that in this work one must consider the so-called umbrella effects that would spread out the effects as much as possible to smaller firms.

The two ministers agreed Sunday that further cooperation should be developed in the following three areas: recent types of steel and their use in offshore work, biotechnology, and research in working conditions.

The West German technology minister said that there are special interest in taking advantage of the experience Norway could offer research on working conditions. The German side also had a good bit to contribute, he said. He emphasized here the importance of being able to include the trade unions in this work.

Minister von Buelow also said that he has invited Industry Minister Bratz for a reciprocal visit to West Germany.

9124
CSO: 3102/94

REORGANIZATION OF MINISTRY OF RESEARCH, TECHNOLOGY

Paris LE NOUVEL ECONOMISTE in French 4 Dec 81 p 4

[Article by Gilles Coville: "The Chevenement Organization Chart"]

[Text] The new organization of the Ministry of Research and Technology (MRT), which has just been presented by Jean-Pierre Chevenement, is a preliminary to another fundamental reform: the regionalization of the execution of scientific policy. For industrialists, this second aspect will undoubtedly be much more important. For the time being, Mr Chevenement is doing business "at the house of methodical doubt" in the old Ecole Polytechnique, rue Descartes, attempting to match together the jigsaw puzzle which he has been handed: DGRST (General Delegation for Scientific and Technical Research), DIT (Directorate for Innovation and Technology, formerly attached to the Ministry of Industry), and Midist (Interministerial Mission for Scientific and Technical Information).

At the beginning of next year, MRT will revolve around two poles: a Directorate for General Policy, responsible for major orientations (plan, program-laws), budget projects, and guidance of research organs; and a Directorate for Scientific and Technologic Development and for Innovation, which assures the effective execution of the policy, and is therefore more concerned with enterprises. The first directorate has been placed in the hands of Jean-Francois Thery, 47 years old, master of requests at the Council of State: researchers will deal primarily with him. The second directorate has been entrusted to a man who is well-known to information processing and oil industrialists: Maurice Allegre, 48 years old, chief engineer at the Ministry of Mines, delegated to information processing from 1968 to 1974, and until recently deputy general director at the French Oil Institute. Mr Allegre will control the purse strings for assistance and credit to industry: he is assuming responsibility for innovation and research funds, and for the guidance of Anvar; he will also represent the ministry in Codis (Orientation Committee for the Development of Strategic Industries) revised and modified by the socialist government. These two directorates will receive support from two other teams: a service for international affairs, led by a diplomat (Jacques Warin), and a scientific and technical mission, directed by a physicist (Yves Farge). Midist remains directly attached to the minister, who is also creating as an adjunct to his cabinet a "center for forecasts and evaluation," entrusted to Thierry Gaudin. As a second phase in the reorganization of MRT, regionalization will occur only progressively, beginning in 1982. The basic idea is to have in each region a representative of the ministry, who will act as liaison with industrialists, laboratories, public organs, banks which finance innovation, and the regional public establishment. Qualified persons for these positions remain to be found.

And finally, Mr Chevenement seems to expect a great deal from the regional advisory committees which are being created right now in the wake of the meetings of research establishments that have been held almost everywhere in France. What will be the real power and structures of these small parliaments of research and technology? For the time being, their promoters are being given free rein. But eventually, these seething initiatives can profoundly change the usual networks of relations among industrialists, researchers, financial supporters, and public powers.

11,023
CSO: 3102/108

BRIEFS

ANVAR BUDGET INCREASE--In 1982, the intervention budget of ANVAR (National Agency for the Valorization of Research) will amount to 760 million F of program authorizations, of which 720 are allocated for innovation assistance, and 40 for innovation bonuses. The 720 million F included in the budget draft are to be compared to the 420 million F included in the initial finance law for 1981; thanks to the 1980 reports and to the 1981 budget correction law (+60 million F), ANVAR will be able to allocate between 600 and 650 million F in 1982. Innovation bonuses in 1982 will reach 40 million F (compared to 30 million F in 1981). They consist of a lump sum payment equal to 25 percent of the research work subcontracted by small and medium enterprises to approved laboratories. And finally, the state budget contribution to ANVAR's operations will be 67 million F (compared to 49 million F in 1981), which implies the creation of 22 new positions in the Paris region, and the confirmation of the decisions taken in the budget correction law concerning employment matters: 54 positions, of which 32 are to be made permanent and 22 are newly created. [Text] [Paris CHIMIE ACTUALITES in French 4 Dec 81 p 4] 11,023

CSO: 3102/108

CIVIL AIRCRAFT BUILDERS LOOK TO COMPOSITES

Duesseldorf VDI NACHRICHTEN in German 4 Dec 81 p 11

[Article by Horst Rademacher: "Commercial Aviation Steering To Plastics. Carbon Fiber-Reinforced Plastics To Replace Metal In Elevator And Tail Assemblies"]

> [Text] Plastic components have become a permanent part of the cabin in commercial aircraft. Every passenger uses the folding table fixed to the back of the seat in front of him or the plastic storage compartment above his seat--both of them components whose failure would pose no immediate danger for the aircraft. Yet the primary surfaces of an aircraft are still generally assumed to be constructed of aluminum. But design programs for elevator and tail assemblies are already working toward the complete construction of these elements from reinforced plastics.

Cautious estimates of European aircraft manufacturers estimate the percentage of plastics in airframes at some 50 percent by the year 1990. By the turn of the century the first aircraft fully constructed of plastics could be in operation--perhaps even earlier in the US. The gradual introduction of modern construction materials in civil aviation is looking like a quiet revolution.

A part of this revolution has already been in flight for several months on a Lufthansa Airbus A 300. The aircraft was equipped for experimental purposes with a rudder which was completely constructed of composite fiber materials (FVW)--except for an aluminum lightning arrester strip. The roughly 8 meter long component is some 40 kg lighter than a similar rudder built of metal. This means the equivalent of an 18 percent savings in weight. According to current inspection reports it can withstand stress just as well as its metal cousin.

Granted that the rudder is not the first component that has replaced metal structures on Airbus-aircraft, but it is by far the most important to date. As early as 1979 floor beams of carbon fiber-reinforced plastic were experimentally installed. These beams carry the stresses from the pressurized cabin to the supporting members of the fuselage.

In August 1979 a further step was taken in experimentation, when the nose of the rudder assembly, i.e. the forward section of the fin in the axis of flight, was produced from carbon fiber-reinforced plastic (CFK). Just recently work began at

Einswarden plant of the United Aeronautics Works on assembly line production of CFK-spoilers for the wings of the A 310 Airbus model (s. VDI NACHRICHTEN 46/81). On the basis of present orders some 900 such spoilers are to be built at Einswarden. What are being built are parts of the aircraft's secondary structure, previously manufactured from composite materials, whose failure poses no immediate hazard for the aircraft.

A portion of the research, development and experimentation activities for CFK components of the Airbus is being carried out by Messerschmidt-Boelkow-Blohm (MBB) at Hamburg. Dieter Schulz, head of its structural mechanics section, explained the goal, "We are looking to get a complete rudder assembly for the Airbus models A 300 and A 319 ready for assembly line production." The most telling argument for why the European Airbus industry is interested in FVW is the reduction of direct operating costs, to be understood as fuel costs.

CFK-produced components can produce a reduction in weight of between 20 and 30 percent as against the same components manufactured from metal. Compared to the already familiar glass fiber-reinforced plastics the saving in weight is somewhat less than 20 percent. The specific weight for GFK materials is measured at 1.8 g/cm^3 and for CFK at 1.5 g/cm^3.

But there are still other reasons that justify the very extensive research program in the field of CFK's being undertaken by the MBB plant in the Hamburg harbor. Said Dieter Schulz, "The rigidity of CFK materials is substantially greater than that of GFK." The two materials differ from each other in their elasticity module by about a factor of 4.

The entineers were obliged to strike compromises in the execution of their substitution concepts. It was not just a matter of attaining a maximum weight reduction, but also at the same time of developing cost-effective production processes. MBB has had experience with FVW in military aircraft ever since 1965. This made the choice of material substantially easier and had allowed the testing of a number of fabrication methods. The choice finally fell on carbon fibers of the type KC 20 and epoxy resins which hardened at about 120°, while the resins employed on military aircraft only hardened at a higher 180° because of the greater demands for temperature resistance.

The rudder is constructed in a sandwich-plate configuration, whereby glass- and aramide-fibers are also employed along with the carbon fibers. The individual panels can be produced almost automatically in modular construction fashion, once they reach the stage of assembly line production.

In addition to the basic properties of the CFK components other material-specific problems involved in their use in aircraft surfaced--solutions which will require heavy research outlay. The major problem associated with FVM use in aircraft is humidity, which, especially in tropical countries, is absorbed by the material. Under poor climatic conditions the degree of humidity can even be measured as a percentage of total weight.

For approval of the components it will be necessary that the elastic parameters of the materials remain within the required tolerances even beyond broad temperature ranges and various degrees of humidity. To test this for the large rudder of an

Airbus, a new climate chamber had to be built especially for this purpose at Hamburg. The largest deviations among the individual material properties were found in the elasticity module, when it was measured diagonally to the axis of the fibers. The module, when compared to dry conditions at 20°, decreases by some 40 percent in a damp atmosphere heated to 70° C.

The tail and the rudder assembly nose should be, by 1983, in full production for use on the smaller Airbus A 310. Since these are of the same construction as those on the A 300, there is nothing to impede their introduction on this aircraft as well. The development of the entire tail assembly, i.e. the entire tailplane body, will not be complete until that time. Dieter Schulz expects that the complete tail assembly will be the first section of the primary structure to be totally constructed of FVW.

The next step with the Airbus will then be an elevator unit of FVW. It is not yet anticipated that this can be installed on the A 320, but only on the type to follow this. The step toward its development is not a very large one after the experience gained with the rudder assembly.

The development program for the tail assembly, including testing, is estimated at 47 million marks, of which the Federal Ministry for Research will put up a large part. Experts believe, however, that for the development of a fuselage and the construction of wings from FVW, a suplementary research program will be required.

Airbus-Industry is, of course, not alone in wanting the introduction of FVW. In the Federal Republic, Dornier, along with MBB, is also working with CFK and, in the United States, NASA has also begun research programs for tail and elevator assemblies of FVW. Such structures have already been flown experimentally on large-scale jets (DC 10, Tri-Star).

A program for the development of fuselage components of FVW will begin in the near future in the United States. The United States is of course several years ahead of Germany in this sector but European aircraft manufacturers hope to be able to shorten the lead by intensive cooperation.

9878
CSO: 3102/126

SAAB DEVELOPS FIRST NONASBESTOS BRAKES FOR 1982 MODELS

Oslo ARBEIDERBLADET in Norwegian 26 Nov 81 p 26

[Text] In the year 1982 Saab will go over to completely nonasbestos brake pads on all models. The Swedish pioneer automobile firm is the first in the world in this field as well. The development of the new brake pads has taken 5 years.

The pads that the Saabs will receive next year will not only contribute to a better environment in the factory, the workplace, and on the road, but increased durability will mean that replacement intervals can be increased up to 300 percent.

"We begun as early as 1976 to investigate alternative solutions to the conventional brake pads that contain asbestos," Sven-Ake Grahn said. He is responsible for the development of the brake systems in the factory in Trollhattan. The most important reason was that turbo models were to be mass produced.

At a top speed of more than 200 kilometers an hour, there is a special demand on the brakes, both in quality and in durability.

It was relatively simple to replace the outer forward brake pads with pads of a completely new type--a special semimetallic pad that contains no asbetos. On the other hand, it was difficult to replace the asbestos in the other brake pads of the car. Grahn says that only now have they been able to introduce completely nonasbestos brake pads.

One cannot simply select any sort of brake pad. The pad has one of the toughest jobs in the car. It must function both in warm and cold temperatures and have the same qualities on dry and wet surfaces, with and without a load. The pad must retain its qualities in the smallest detail.

These various demands are difficult to attain because there are pads on both sides of the brake disc, and both pads are exposed in differing degrees to cold air and moisture. The picture is complicated greatly by the fact that the forward brake pads are also worn more quickly than the back ones because of greater load.

Sven-Ake Grahn says that the factory has found a solution based on the use of semimetallic inner and outer pads on the forward brakes and organic asbestos-free ones in back. Both types are completely nonasbestos and deliver exactly the braking qualities needed at various speeds and under varying driving conditions. And on top of this, they have a very long life. The average driver can plan on driving between 70,000 and 90,000 kilometers before having to replace the brake pads.

9124
CSO: 3102/94

INTERNATIONAL HIGH-SPEED-TRAIN CONNECTION UNDER DISCUSSION

Duesseldorf VDI NACHRICHTEN in German 11 Dec 81 p 7

[Article by Paul Kalinowski: "Magnetic Railroad Route Frankfurt-Paris Under Discussion"]

[Text] Trains travelling at a speed of between 300 km/hour and 500 km/hour are to link the centers of the European Community. It is not yet certain whether they will run on electromagnetic tracks or use the wheel-on-rail system. There is also no plan for European transportation in existence. This emerged from a seminar held by the German Society for Transportation Policy in Kassel.

"Rail Systems for Long-Distance Transportation" was the theme of a two-day seminar in Kassel. No fewer than 25 speakers, experts in innovative wheel-on-rail (R/S) projects and electromagnetic systems (EMS) gave a "self-contemplative view of what has been achieved in the area of new high-speed rail systems for speeds up to 500 km/hour and how matters will continue. The organizers, the German Society for Transportation Policy (DVWG), had given themselves no easy task in presenting all aspects of the "project of the century." Optimists and sceptics alike had their turn; technicians, economists, lawyers and politicians.

Since these enormous projects only make sense when they are carried out beyond national borders, the horizons of transportation policy were also illuminated, from a German and French perspective. The conclusion was: for the foreseeable future no one is thinking in terms of a European plan for high-speed railroads, such as unified, common transportation. There are also no far-reaching transportation policy goals for passenger transportation. The range of vision currently does not extend beyond 6 months. But new railroad systems require long-range vision extending beyond the year 2000. European dimensions are needed if the projects are to be given any chances of being carried out. The requisitions for the new high-performance, high-speed railroads also depend on how their range of use is located between traditional railroads and air traffic.

Figures on the expenditures for railroad technology research give some insight into the Ministry for Research and Technology's research and development program for railroads. Until 1980, DM 675 million had been spent. Between 1981 and 1984 an additional DM 115 million will be available annually. Although R/S research will be continued (one-third of the research funds), the majority of the measures

to give subsidies are in the magnetic railroad sector. In the technical-economic part of the seminar it became clear that it is primarily in the roadbeds that problems in design and construction still remain to be solved if they are to be travelled on at speeds of 300 km/hour to 500 km/hour. No serious difficulties are expected with the vehicles. Their share of the investment structure is small, and there is past construction experience to fall back on.

The big question, which will probably remain unanswered for a long time, is whether future high-speed railroads are to run with the traditional wheels on rails or with "magnetic wheels." In presenting the technical possibilities for both high-speed rail systems, the guests from France laid down the trump cards with the results of their newest generation for passenger transportation, the "High-Speed Train (TGV)." For them there is no doubt that speeds up to 400 km/hour can be reached with the classical R/S system, and no new infrastructure for high-speed railroads is required. There would also be no difficulty in picking up current, as the 380 km/hour record run demonstrated. These were the findings concerning friction between wheel and rail: "Under all circumstances a grip of 10 percent at 300 km/hour and of more than 6 percent at 450 km/hour can be expected."

Those in favor of the magnetic rail system and of the wheel-on-rail system presented impressive research results. At the end of the coming year the 20.6-km-long Transrapid test facility at Emsland (TVE) will be completed, on which the magnetic railroad will be tested as a complete system. These are the overriding design criteria: Time of use each day, 18 hours; -25°C and +40°C; wind, 25 m/sec, normal levels of precipitation, noise level 53 dBA at 25 meters and 65 dBA at 1 meter, 60 dBA inside the vehicle. Maximum acceleration levels are: longitudinal 1.5 m/sec^2, lateral 1.0 m/sec^2, vertical 1.0 m/sec^2.

Japanese experiences concerning the use of high-speed trains came up for discussion. It is unarguable that the high-speed train services have been exceptionally well received by the Japanese market. On the other hand, the other services of Japanese Railroads (JNR) show serious declines. In spite of the profits of the high-speed trains, particularly of the Shinkansen trains, the JNR's debt continues to climb (converted at current rates it is DM 80 billion). Further expansion of high-speed routes is now in question in Japan.

A study of planning processes and the public introduced a sour note into the designs of the high-speed rail planners. It showed what difficulties can be expected in constructing high-speed rail systems. All the participants agreed that high-speed rail links have to be created between the countries of the European Community, if the countries on the periphery are not to be allowed to waste away. But opinions are still sharply divided about how this is to be done. Case studies for comparisons of systems on the 560-km model route between Frankfurt and Paris are expected to clarify matters. The basis for the EMS is a traffic load of 3.3 million passenger kilometers per kilometer of the network per year. The cost: about DM 17 billion. The studies for the EMS corridor Frankfurt-Kaiserslautern-Saarbruecken-Metz-Reims-Paris should be transferable to the Cologne-Frankfurt and Frankfurt-Munich stretches.

9581
CSO: 3102/124

FUNDS RESTORED FOR WHEEL-ON-RAIL RESEARCH

Duesseldorf VDI NACHRICHTEN in German 4 Dec 81 p 1

[Article by Ralf Roman Rossberg: "The Railroad To Pick Up Speed. Wheel-Rail Research To Continue--Magnetic Rail Experimental Facility To Keep Its Lead"]

> [Text] The support for the planned wheel-on-rail experimental track Rheine-Spelle-Freren in Lower Saxony, scheduled to be put in abeyance this fall, will be continued. After a recent announcement of support by the Federal Ministry of Research and Technologie, continuation of its construction is assured, if the first section of the experimental magnetic track in the Emsland can be completed as scheduled in 1983. Until then only funds for right-of-way stabilization are available.

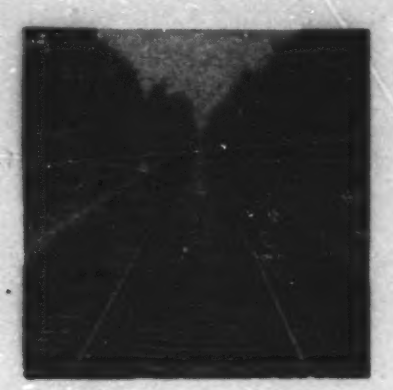
The German Federal Railroad (DB), which does not include research projects within its competence, regards the decision as decisive for the future. Its goal is to optimize the railroad system as a whole; to reduce deterioration, energy needs and environmental impact to a minimum; to make appropriate investment decisions with respect to its projected longevity and later to be able to make the requisite comparisons with the magnetic rail system.

The president of the Federal Railroad's central office at Munich, Theo Rahn, stated during an on-site visit, that the Federal Railroad could, like the French national railroad, reach speeds of 260 km/h safely even now, if the appropriate stretches of track were available. Even in France the presently available technology could be and, in fact, must be substantially improved. This is a decisive factor for wheel-track research in the Federal Republic.

Part of this research is being undertaken at the dynamometer facility at Munich-Freimann using simulation models in place. Confirmation of the results obtained there is not possible on an existing nor on any of the planned new stretches, but only on an experimental stretch that is full equipped with all test facilities.

The test and most easily attainable solution within the near future would be an expansion of the 22.7 km Federal Railroad stretch Rheine-Spelle-Freren for experimental runs of up to 350 km/h speeds. For some 6 km, the right-of-way is already capable of such forces. Another 4 km long stretch which did not require right-of-way stabilization has already been prepared for trackbed and superstructure to meet the requirements of the experiments. Planning, acquisition of right-of-way and

construction materials have already cost an investment of some DM 20 million. The Ministry of Research and Technology had already approved expenditure of DM 108 million, when the tense federal budget situation led to the total elimination of funding for the experimental track. In the meantime, sufficient funds to complete at least the stabilization of the right-of-way have been approved. The magnetic track project on the other hand, will require an annual expenditure by the Federal Railroad of 60 to 70 million marks until 1985.



For a distance of almost 23 km the Federal Railroad track stretch Rheine-Spelle-Freren cuts through the flatlands of Lower Saxony. The track, which is now used by only a few freight trains, is to be extended for high speed experiments of up to 350 km/h. The recently cancelled funding for its construction is now assured until 1983. Some DM 20 million have already been invested in concrete sleeper construction--as seen in the photo.

9878
CSO: 3102/127

RESEARCH, PLANNING COMPANY FOR MAGNETIC RESEARCH FOUNDED

Duesseldorf VDI NACHRICHTEN in German 4 Dec 81 p 2

[Article: "Joint Magnetic Track Project With Railroad And Lufthansa. Experimentation And Planning Company Founded"]

[Text] At the end of November in Munich the Research and Planning Company for Magnetic Track Systems was founded. Among its shareholders are the German Federal Railroad, the German Lufthansa and the Ottobrunn Industrial Engineering Company (IABG) of Munich.

The primary task of the new company will be the operation of the experimental magnetic track installation in the Emsland, currently under construction, with a first section of track scheduled for completion in 1983, as well as evaluation of the magnetic track from the perspective of potential users; studies of the user acceptance of such a system, exploration of potential applications and, finally, the dismantling of the stretch from its right-of-way after 10 years.

In line with this the activity of the new company is, for the moment, limited to the next 10 years. Within this period it is expected that some 140 million marks will be made available by the Federal Ministry for Research and Technology according to present plans; of the annual allocations, some DM 10 million are scheduled for experimentation and the other DM 4 million for other expenses.

The Magnetic Track-Transrapid consortium, which is responsible for the planning and construction of the magnetic track system with the Emsland experiment station, will continue to exist. The division of responsibilities between the two entities still remains to be clarified in detail, though basically the new company will be responsible more for questions related to its application and the Transrapid Consortium with questions of further technical development.

The German Federal Railroad, which has figured to date more as an attentive observer of the magnetic track activities, is, by its participation in the research and planning company, documenting its claim to the management of an unconventional long-distance transportation system within its bailiwick. Nonetheless, there are at the moment no signs of this evident either in domestic or European traffic.

9878
CSO: 3102/127

FUEL-SAVING PROPELLER UNDERGOES TESTING AT DORNIER

Duesseldorf VDI NACHRICHTEN in German 11 Dec 81 p 4

[Article by Erhard Heckmann: "Economical Propeller Undergoes Testing"]

[Text] Rising fuel costs have reawakened interest in propeller-driven aircraft. Different goals are emerging in research and development in this area worldwide. In the United States work has concentrated on increasing maximum speed, which is to be raised from Mach 0.75 to Mach 0.80. The American government is giving $200 million to support this work through NASA, which is to be spent just for the development of new types of propeller. One need only recall the four-blade "scimitar" propeller, with its sharp offset and curved axis. Work on critical integration problems, such as the behavior of the engine air intake airflow, problems involving the combination of sweptback wings and propeller engines and vibration stress on the aircraft fuselage has not been excluded.

In Great Britain propeller development is taking another direction, to be precise, the search for a new type of propeller which is to be the successor to the highly successful Rolls-Royce Dart turboprop (1,000 kW). It was announced recently that British Aerospace Dynamics is testing propellers with from six to eight blades in the wind tunnel with this goal in mind.

The USSR tested an eight-blade propeller in an Antonov 24 transport aircraft for an output of 3,000 kW at a speed of 1,245 revs/min.

In the FRG efforts are being directed at a different area of application--general aviation. In Oberpfaffenhofen at the beginning of October, flight testing began of a new propeller for twin-engined aircraft with engine developing about 550 kW. Development is being carried out as part of the Civilian Component Program (ZKP) of the Ministry for Research and Technology (BMFT), under the direction of Dornier and in cooperation with the Hoffmann propeller works in Rosenheim, the German Air and Space Travel Research and Test Institute (DFVLR) and the Technical University of Stuttgart.

Since conventional propellers attain only about 50 to 70 percent of maximum thrust when the aircraft is stationary and 90 percent in level flight, estimates are that considerable improvements in thrust during takeoff and the ensuing climb can be achieved (from 18 percent at rest and between 4 and 6 percent while climbing). The new propeller will result not only in a reduction of noise but also in a reduction of fuel consumption of about 5 percent. The original Hartzell

propeller from the TNT test aircraft (TNT stands for New Technology Wing) is being used as the starting and reference point. For the new propeller newly developed profiles were used with better lift-drag ratios at high lift coefficients and without negative pressure areas in the design. The blade planform and the radial twist were optimized to achieve better distributions of lift coefficient, flow and induced axial velocity. The two propeller designs that resulted from this work differ only in the sweep of the blade tip.

For the testing now taking place the conventional Hartzell propeller is on the right-hand engine and the new TNT propeller is on the left-hand engine. There are plans to equip the Dornier Commuter/Utility 228 series with this new propeller after testing and certification have been completed. On the basis of the experience gathered, there is a possibility of developing propellers for other categories of aircraft and putting them into production in the German aircraft industry.

9581
CSO: 3102/125

BRIEFS

ATR 42 PROJECT BEGINS--On 7 November Aerospatiale in France and Aeritalia in Italy signed an agreement which contains the official start of the program for the new short-range and commuter passenger aircraft ATR 42. The ATR 42 is a shoulder-wing design with a T-form tailplane for 42 to 49 passengers, powered by two turbo-prop engines. The new short-range aircraft is designed for routes with a maximum length of 1,300 km. Powered by two Pratt & Whitney of Canada PW 100/2 engines, each developing 1,658 kW (2,200 shaft horsepower), the ATR 42 is expected to reach a maximum speed of 510 km/hour. Maximum takeoff weight is given as 14,510 kg. Maximum weight without fuel (MZFW) is quoted as 13,780 kg, empty weight with equipment as 9,062 kg. Maximum fuel load is 4,500 kg. In its base version the ATR 42 will have a length of 22.7 ms, a wingspan of 24.57 ms and a height of 6.45 ms. With a load-bearing surface of 54 m^2 the maximum surface load is 269 kg/m^2. The ATR 42, with which France and Italy want to secure their share of the commuter market, which is now undergoing tempestuous development, will most probably be shown publicly for the first time at the Paris Aerosalon. The ATR 42 is to be offered in a number of different versions. As a passenger aircraft for short-range and commuter traffic it will have two rows of two seats each. The aircraft is to be designed from the outset in such a way that it can easily be converted into a freighter by removing the seats, with a large loading door at the left rear of the fuselage. First deliveries of the ATR 42 are planned for the second half of 1985. [Text] [Gelsenkirchen AERO-KURIER in German Dec 81 p 1528] 9581

CSO: 3102/125

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JPRS 80169

23 FEBRUARY 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 93

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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JPRS 80169

23 February 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

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ENERGY

BRIEFS

COAL CONVERSION PLANS CURTAILED--Bonn--The RFG has revised downward its alternative energies program for producing gas and gasoline from coal, it was announced 21 October in Bonn. For technical and financial reasons, indicated an informed source, probably only three or four of the 11 large-scale gasification plants originally envisioned will be built. As for the three coal liquefaction plants and the lignite liquefaction plant, which are slated to be built between now and 1992, no decision was made, but there too it is probable that the program will be curtailed. According to an official statement issued after the federal cabinet meeting at which the program was reevaluated, seven gasification projects representing a total investment of DM 4.7 billion ($2 billion) are still on the agenda. According to the statement, the projects ultimately approved will be eligible for federal government financing of up to 40 percent of the total amount of the entire investment. For that purpose, it was decided by the cabinet, a total of DM 1 billion of credit is to be set aside for 1982 through 1985. As concerns liquefaction, the statement indicates that DM 100 million in research credits have been written into the 1982 budget to provide financial support for the pursuit of studies on the four projects proposed by the West German industry. At the Ministry of the Economy it is indicated that the three or four large-scale gasification plants having the greatest chance of being built are those planned by the Ruhrkohle-Ruhrchemie, Kloeckner, and Rheinbraun firms and the West German subsidiary of Shell. The projects planned by the first three of these firms represent a projected total annual production of 3.3 billion cubic meters of synthesis gas by about 1986, which would satisfy about 5 percent of the annual gas consumption of the FRG. [Text] [Paris AFP SCIENCES in French 22 Oct 81 p 36] 9828

CSO: 3102/78

LASERS GAIN IMPORTANCE IN INDUSTRIAL APPLICATIONS

Paris L'USINE NOUVELLE in French 19 Nov 81 pp 118-124

[Article by Patrick Piernaz: "The Laser Revolutionizes Manufacturing"]

[Text] Precision, quality, high cutting speed, and reliability are enabling the laser to make a virtual forced entry into manufacturing shops. Whether used for cutting steel, ceramic, fabrics, paper, plastics, or whatever, its applications seem endless, and the market opportunities are enormous.

A slight hissing, a workpiece being pulled in a rotating motion. That is all. In 15 seconds a commutator for an automobile starter was "machined by light." The absolutely invisible beam from a 1,200-W carbon dioxide laser shone on the workpiece and tracked across its surface like a stylus moving across a record--a "record" composed of sheets of copper separated by Bakelite, which had to be scraped to a certain depth. Delicate work. In conventional milling, up to now, it was necessary to take care to avoid touching the copper sheets. The laser is not hampered by these limitations. It illuminated everything, but only the Bakelite was vaporized. The engineers simply utilized the property that copper reflects like a mirror the radiation from this type of laser.

This equipment, the only equipment of its kind in the world, has been in operation for 6 weeks amidst other machines in the shops of the Paris-Rhone company in Lyon. The operation is repeated 250 times an hour, 16 hours a day. The tempo is intense. This application brilliantly shows that the laser in the industrial sector is not confined to the laboratory. Its reliability and its efficiency make it a superb tool. At Paris-Rhone the laser machine works at the speed of six conventional milling machines or four of the new advanced machines. At equal capacity the investment proves to be 20 percent less expensive, and the cost of the machining operation is 20 percent lower. "But primarily," insists Michel Geay, the person in charge of the new developments, "the use of the laser has put an end to the mechanical contact between the tool and the workpiece. There is no longer a risk of jarring the sheets, which could cause their detachment. The result: Our starters have better quality and are made with increased reliability."

Subcontractors Are Getting the Equipment Sooner

This is not an isolated example. The laser is in the process of revolutionizing manufacturing. Enteprises which have had the courage to acquire laser equipment are already scoring points. At SNIAS [National Industrial Aerospace Company] of

Marignane, part of the worldwide success of the Ecureuil and Dauphin helicopters is attributable to their glass fiber reinforced rotor hubs, the elements of which are cut with precision using the laser. In this application, the laser has replaced manual cutting on the "cutter," resulting in a sixfold reduction of working time and a radical elimination of defects. The laser also has supplanted a manual operation at Delta Voiles [Delta Sails] in Montpellier, where the chairman, Michel Mante, wanted "to put an end to the backbreaking task of the cutter, who worked on his knees on the floor." As an extra benefit, the execution time was reduced by a factor of four and the accuracy of the cutting has given the owner of this small to medium-size industrial enterprise a head start on the American sailmakers, who still use traditional methods.

And there is no shortage of other examples. To name a few, at Liebherr, in Colmar, power shovel cabs are cut by laser; at Acrilux, in Ivry-sur-Seine, electric signs are made; the Papeteries de Malaucene [Malaucene Paper Mills], near Carpentras, make tens of thousands of holes per second in cigarette paper. And the future applications are completely astonishing, too. At Renault there is a laser which will soon be stripping insulation from electric wires; at Eram, for the first time in the world, a battery of machines will cut out the leather parts for shoes, at one stroke eliminating the very costly cutting tools while achieving appreciable raw material savings.

The industrial uses of the laser seem endless. Furthermore, they are not limited to cutting, but also include welding, thermal treatment of surfaces, and marking of parts. And, as with any new technique, according to a phenomenon already observed with machining by numerical control or with electrical discharge machining by wire, the subcontractors have been the first to sense the opportunity and are acquiring laser equipment sooner than the large companies.

That is true for Getelec, among others, a small to medium-size industrial enterprise in Clamart with 25 employees, who cut and bore holes in ceramic hybrid circuits. "The big companies at first subcontracted some parts out to us to find out about the feasibility of the operation before buying the equipment for themselves," explains Gerard Dusailly, manager of Getelec. "Now they still continue to pass some orders along to us, since we offer quick lead times, on the order of 8 days for production runs of 10 to 100 pieces. Our laser operates 8 to 16 hours a day."

But when the laser is mentioned, the conversation usually revolves mainly around materials such as Bakelite, glass fiber, leather, plastics, ceramics, and the like. And what about metal? Well, the applications were relatively scarce until just recently, but since the beginning of the year things have changes, since one rainy day in January when a German truck pulled up at the gates of the Nollet Company in Lys-lez-Lannoy, near Roubaix. It came to deliver the first laser punch/nibbling machine to be installed in a French factory.

"I felt that there was a market in the subcontracting field for cutting sheet metals with the laser," recalls Philippe Nollet, the chairman. "But it took us several months to find it." His market includes small runs of sheet metal items, which would be too small to allow amortization of a cutting tool; machining of hard metals and annealed parts, which the laser can machine without reworking and without subsequent truing; delicate and intricate parts incapable of being produced on the press; etc. His market also includes any parts needed in a hurry. When the program is already available, a production run can be turned out in 48 hours, whereas a

special tool would require a 2-month wait. "This means that large runs of items are not off limits to the laser," explains Philippe Nollet. "As proff: We have already filled a rush order for circlips for an automaker."

But Philippe Nollet, who now has his order book filled 3 months in advance, will not remain in all alone in this favorable position for long. The firm Le Materiel de Voirie [Roadway Equipment] in La Charite-sur-Loire installed a machine of the same type to use partly for subcontracting work, followed in July by Stemp in Roissy-en-Brie, one of the most modern sheet metal plants in France, which acquired a cutting machine equipped with a 1,200-W laser. "We are the first plant in France to have a numerical control punch, a machine considered commonplace nowadays. We wanted to use the laser to regain the lead over our competitors and rapidly apply our know-how to this market," explains Bernard Radier, president of Stemp. Almost simultaneously another subcontractor, Socomec in La Souterraine north of Limoges, installed a laser-equipped numerical control punch in its shop "to get away from our traditional market of large-run parts and diversify in the direction of a different clientele," says Gerard Viniane, technical director.

No doubt the introduction of powerful lasers into the plants of subcontractors will revolutionize the market, because their first job is to acquaint the design departments with what the laser can do, as Philippe Nollet explains. "Engineers from all corners of the globe are seen trooping through our facilities, having come to investigate the possibilities of applying the laser to their problems in cutting out chain links, farm equipment joint supports, car seats." This groudwork begins with tests, orders for prototypes, and preproduction runs. And when these enterprises become convinced of the feasibility of the process, they will order the equipment for themselves. Only at that time, toward the middle of the 1980's, will the market really be in a position to take off.

This is not to imply that it has not already developed quite well on its own. "The sales of lasers for cutting metals have tripled over the last 2 years, and the rate of growth will not be less than 20 percent per year over the next 5 years," confirms Scott Nix, manager of Coherent BmbH in German.

Presently, the market for the laser is dominated by the Americans, with two giants in the lead: Spectra-Physics (Fr 840 million in revenues), which in 1979 bought the laser division of GTE-Sylvania, and Coherent (Fr 390 million in revenues), which in 1978 acquired Laser Inc. But these companies do not derive all of their revenues from industrial lasers. And they have to compete against some enterprises of more modest size but well entrenched in their special niches, such as Photon Sources, Avco, and Control Laser, which last year acquired the laser division of the British firm Boc Limited. As a matter of fact, the industrial market, according to the trade journal LASER FOCUS, increased to FR 390 million for 1980, and this year exceeded FR 447 million. Half of this market is in carbon dioxide lasers, the rest being split up among the various types of crystal lasers, particularly the YAG laser.

Principal Characteristics for Industrial Applications

Type of Laser	Active Material	Wave-length (H)	Mode of Operation	Method of Excitation	Energy or Power	Applications
Pulsed YAG	Yttrium aluminum garnet doped with neodymium	1.06	Pulsed	Optical	A few joules	Adjustment of resistance, machining thick or thin films, spot welding, piercing small holes
Continuous YAG	"	1.06	Continuous	Optical	Up to 900 W (laboratory)	Welding, piercing
Glass doped with neodymium	Glass doped with neogymium	1.06	Pulsed	Optical	Up to 500 W	Piercing
Ruby	Alumina doped with chromium	0.69	Pulsed	Optical	Up to 500 J (Laboratory)	Piercing of considerable thicknesses
Carbon dioxide	CO_2 in presence of nitrogen and helium	10.6	Continuous	Electric discharge	Up to 2 kW (industrial) 20 kW (semi-industrial)	All treatments of materials, welding, cutting, piercing, thermal treatments

Source: Institut de Soudure [Welding Institute].

Curiously, the Japanese are absent from this market. But for how long? Mitsubishi, Hitachi, Toshiba, and Matsushita are all known to be working overtime to close this gap. This would only be to succeed in building the famous "factory without people" desired by the Japanese Ministry of Industry. This would be a plant where one 20-kW laser source would serve to distribute through the shop a beam off which the machines would be "branched." Meanwhile, the European manufacturers are not sitting still; there is the case of J. K. Lasers in England and Laser Optronic and Carl Baasel in Germany, not to forget Messer-Griesheim specializing in oxygen cutting, which succeeded in selling 50 500-W laser machines, two of them in France. French laser manufacturers are no longer entirely absent from the market. Specifically, a small to medium-size industrial enterprise in Bordeaux, Lectra Systems, had already sold on the world market 200 machines for cutting cardboard patterns used in the

ready-to-war garment industry. But primarily France can claim to have on its soil the first European manufacturer, Compagnie Industrielle des Lasers (CILAS [Laser Industrial Company]), a subsidiary of CGE [General Electric Company], which was one of the first to enter the market, by selling--starting in 1975--a Moulinex laser used in the manufacture of vegetable mills. Since then, it has followed a "stop and go" policy, which has had the result that up to now it has not served very many industrial applications nor has it offered a complete line of machines. "We arrived on this market very early, perhaps even too early," explains Roland Roux, head of the private-sector commercial division of CILAS. "And we wore ourselves out selling the installations one by one on a market which was not ready. To stay afloat during that period, we successfully branched out into two bread-and-butter sectors: The medical laser and grain size measurement." With the latter application, CILAS managed a world breakthrough: It sold 10 instruments in Japan, 15 in the FRG, and several tens in the othe European countries. The sales of these instruments are showing a growth of 25 to 30 percent per year.

But the enthusiasm which presently reigns in cutting equipment has prompted CILAS to prepare for its return to this stronghold, particularly given that this company, which does 75 percent of its business (Fr 100 million) in military applications, would like to cut back the military/civil ratio to about 50/50. Furthermore, it has always maintained a presence on the market, selling among others the two 10-W lasers to Delta Voiles, a 3-kW laser to the AEC [Atomic Energy Commission] for studying the use of the laser in a contamination zone, and especially a 1-kW laser to an Italian subcontractor, Cavis, which cuts premolded moquettes for Fiat. The latter installation has been run for 5,500 hours. Furthermore, it was CILAS which was chosen by SNIAS to furnish a new machine for cutting glass and carbon fibers, which will be installed in Marignane at the end of the year. To obtain a better hold on the market, CILAS will round out its product line. It offers two 20- and 50-W models, and covers the range from 1 to 3 kW thanks to its agreements with its former Belgian affiliate CBL [Belgian Laser Company]. Two new lasers are under study, a medium power model (500 W) and a high range model (5 kW).

For these developments, the French company would be able to take advantage of part of the development assistance credits available through the Ministry of Industry. Only part, since the public funding could also go to aid the rising star of the Fench laser, Claude Benedite, a physicist who left the teaching profession to set up his own company, the Claude Benedite Laser Techniques firm, in the Limoges area. A truly amazing man, this Claude Benedite. The laser machining equipment at Paris-Rhone is his; the cutting of leather at Eram is also his doing, as well as the Stemp laser, the Socomec laser, the stripping of electric wires at Renault, and on and on. A man who started with nothing 2 years ago, who knew how to discover new markets, propose solutions, and deliver turnkey equipment.

The development of his business has also been quite amazing. "All our predictions have been surpassed; for 1981 our business will be about Fr 13 million, and we had only been aiming for Fr 2.5 million," explains Claude Benedite, who has not had difficulty finding private funding to swell his capital from FR 330,000 to FR 2.5 million. His premises are going to be enlarged by 800 m^2.

First Affected: The New Projects Department

For the time being, Claude Benedite installs and adapts lasers from an American source (Photon Sources) and builds turnkey machines. However, he wants to produce lasers completely "made in France" and wants to obtain on the French market such

items as optical components (mirrors and lenses), tubes, current regulators, vacuum pump systems, etc. This already very advanced project will soon lead to the creation of a new company, the Compagnie Francaise des Lasers Industriels [French Industrial Laser Company].

There is in fact an opportunity to be seized by the French laser manufacturers to the extent that the market has not yet taken off. The Americans, if they are present in France, have not really "gone all out" on our market. Perhaps they are still too preoccupied up with their domestic market, which represents 70 to 80 percent of sales. But this situation will change. Lawrence Osterink, manager of the industrial laser division of Spectra-Physics, estimates in an interview in LASER FOCUS that "the American Market ought to decline, while the Japanese market should expand by a factor of 10 over the next few years. As for Europe, sales could build even faster, at a rate of 50 percent per year until it catches up to the American level."

In any case, the first French users will shape up as something of pioneers, since if the laser revolutionizes machining, it will also cause considerable unsettling of work habits. Whether buying the machine, installing it, putting it in production, or maintaining it, employees of the user companies are confronted with new problems imposed by a technological change. First to be affected by this change is the new projects department, because primarily it is necessary not to labor under the misconception that the laser is an ordinary instrument. "A laser is first of all an optical system" insists Claude Benedite. "It must be protected from vibrations, dust, and the temperature variations which cause expansion of the lens mounts." It is best to deal with all these problems at the same time the layout is being worked out.

Perhaps not everyone will have to take the same measures as Philippe Nollet, who had a special 625 m^2 area constructed with electric heating through the floor, the cost for which came to FR 1 million, yet that is certainly a good way of maintaining and protecting the adjustment of his equipment. Paris-Rhone did not take things lightly either: "We intended to install the laser in the production ship. It was necessary to eliminate vibrations at any cost," explains Michel Geay. "We therefore recorded vibration profiles at floor level and constructed a concrete slab mounted on Silentbloc to isolate the resonator. Moreover, it is separated from the work area by a wall. And the temperature in the shop is maintained through the night." At Socomec, also, the machine was placed on an isolated concrete slab a meter thick. "But, in spite of everything, the machine vibrated; it was necessary to brace it and tighten it down," recalls Gerard Viniane.

On general principles a business executive should think about informing his personnel to ensure the success of the operation. "It is very important for him to get his colleagues involved in the introduction of this new means of production," agrees Bernard Radier, who conducted numerous demonstrations intended to reach all members of the company. Michel Geay asked the maker to show a film; he also supplied information regularly to the joint production committee and the health and safety committee. Meanwhile, the safety engineer asked the factory inspection team to come see the machine. "And then we spent 10 days to inform the people in small groups: Engineers, foremen, controllers, employees, anyone who wanted to could come." After the installation, Michel Geay made it a point to act on the two main comments of the personnel: The noise, which necessitated isolating the work platform, and the lack of comfort of the safety glasses (he is going to have some specially fitted glasses made).

When all these aspects have been analyzed, there is nothing left to do but start up the machine. Hold on, no such luck! Months will go by before this machine produces at full capacity. "It took us nearly a year to finish our apprenticeship, master the adjustment parameters, and invest in client studies while perfecting part programs," Gerard Dusailly of Getelec is careful to point out. This situation is common among all subcontractors, who are only able to adjust their machine for a single type of part. In another case, the orders may not come right away, and it is necessary to proceed with some tests. "In the beginning, the machine only worked efficiently about a fourth of the time," declares Philippe Nollet. "The rest turned out to be spent in equal parts on adjustments, tests, and maintenance."

Furthermore, adjustment of the laser is not the only source of problems. By itself, it is nothing but a ray of light. It is necessary to add to it a system for displacement along two or three axes, which will provide the cutting motion. And everything is actuOted by a numerical control system. Manufacturing with the laser, therefore, implies first programming the design of the part on a numerical control system. "In that, it is not necessary to restrict ourselves to simple programs," advises Philippe Nollet, "since the laser's strong suit is really the complicated parts. Thus, for our first applications the time for programming could be as much as 4 or 5 hours, while themachine work per se did not take more than 40 to 50 minutes." Philippe Nollet, who was not big on programming, finally decided to acquire a very powerful programming assistance system, which made it possible to cut the time for punched tape preparation by a factor of four. Stemp, which was already familiar with the programming of numerically controlled punches, nevertheless acquired a sophisticated numerical control system in order to deal with all these problems properly. This does not prevent Pierre Fournier, the technician in charge, from often "having to stay late in the evening in front of his machine with the manual written in English," and he considers it necessary to have a good math background to solve all the elaborate cutting situations.

Even the cutting of sails poses difficult geometry problems, enough to justify the acquisition of a powerful (64K) General Automation computer. "Because our strength with the laser was in cutting precise, and accordingly complicated, shapes, which are described by equations of the third or fourth degree," explains Bernard Mallaret, engineer at Delta Voiles. That all tends to explain why the people in charge of the use of these machines are very often on the senior technician level and often take an 8- to 15-day course at the laser factory.

This is particularly true as regards the maintenance problems, which crop up after a few weeks of use. Indeed, though the industrial lasers are considered reliable, their maintenance is nonetheless very exacting. "Not too much even then," adds Claude Benedite. "It is not necessary to be an expert in lasers to operate one and maintain it." These continual maintenance operations can easily be handled by a technician at the user company: Regular cleaning of the optics (lenses and mirrors), replacement of the dry filters in the gas circuits (every 3 months), and changing the oil on the vacuum pump (every 3 months). The major repairs are reserved for the maker. "This is not to say that one should stand idle in a case of a sudden breakdown," explains Michel Geay. "It is necessary to know how to identify the prblem and try to localize it with help, over the telephone, from the maker. In 90 percent of the cases it is possible to do some good and save precious time that the machine would otherwise be out of commission."

It is thus a very good idea to thave replacement parts on hand at the user's plant. For example, SNIAS of Marignane considers it appropriate to stock all key parts: Mirrors, lenses, circuit boards, etc., and even three complete replacements for the vacuum pump, becauee it would be out of the question to have the machine shut down for several days because of the failure of one component. Michel Geay, at Paris-Rhone, limits himself to focusing lenses, tetrodes, filters, and the oil pump.

All these drawbacks have not, it seems, been enough to shake the enthusiasm of the users, practically all of whom are thinking about getting a second machine. Two of them have already taken steps in that direction. At the end of December SNIAS of Marignane will install a new 1-kW laser, faster and more accurate. A few weeks later it will be Paris-Rhone's turn, as they will begin using an entirely automated machine with robots for feeding and removal of work and offering production rate twice that of the present equipment.

9828
CSO: 3102/78

AUTOMATION AT ASEA ALLOWS UNMANNED SHIFTS

Stockholm NY TEKNIK in Swedish 10 Dec 81 p 28

[Article by Sven-Olof Carlsson]

[Text] ASEA [Swedish General Electric Corporation] in Helsingborg is one of the Swedish firms that have had long experience with unmanned production using industrial robots.

There are three robots in two machining groups for the production of gear housing components for electric motors.

If necessary, the production groups can be used for unmanned extra shifts.

Ingemar Axberg, head of production engineering, says: "It is most profitable for us today to operate unmanned on regular shifts. Our workload these days, like that in the rest of the engineering industry, is such that there is not much need for extra shifts."

ASEA in Helsingborg has several lines for the production of electric motor gear housings. The gear housings are produced in various sizes, and it is the smallest types in the largest lot sizes that are manufactured partly by unmanned production.

The line where the industrial robots are used is designed to produce 35,000 gear housings annually, a figure that is not being reached today.

Two industrial robots are used in one production group to machine castings, and one robot is used in another production group for machining shafts. The production groups take 2 minutes to do the work that used to require three-quarters of an hour manually, despite the mass production system.

The Helsingborg factory also has an automatic painting line that uses a Norwegian Trallfa robot. There the gear housings are painted after final assembly or after being mounted on the electric motors. The painting robot is programmed for all types and automatically changes its program and movement pattern.

Ingemar Axberg says: "For each machining group, we have input and output hoppers large enough to keep the unmanned operation going for a few hours. If necessary, we can easily enlarge the hoppers and operate unmanned for a whole shift."

Long Experience

The Helsingborg factory put its robot production groups in operation in 1977, and its experience with NC [numerically controlled] machines goes back even farther than that. The first NC machines went into service in 1964, and about 30 are being used today.

Ingemar Axberg says: "The robots and the stroke transfer machines--which carry and hold the parts to be machined--have high availability. There are a few more problems with the NC machines, so they determine the availability of the machining groups as a whole.

"But we have reduced the failure rate and set-up times by using a system in which we change the entire tool unit in the machines and not just single drills, milling wheels, or grinding wheels.

"We also have a maintenance schedule in which operating time and wear are closely followed so that we can have the tool changed before it runs the risk of breaking down."

Utilization of one of the machining groups has increased, incidentally, in terms of the original sequence chart.

During what used to be idle time, a grinding machine can now grind down close surfaces on the shafts while the other machines are going through their cycles.

Retraining

When the robot production groups were introduced, the result was sharply reduced manpower requirements for the production of small gear housings. Manual production required 13.5 persons for the machining of castings. Only 2.5 persons are required today. In the case of shaft machining, the reduction was from 5 to 1.5 persons.

Ingemar Axberg says: "Since we have manual production on the lines for larger gear housings, we were able to transfer people to those lines. Some were retrained to operate the robot machining groups. That, combined with natural attrition, has meant that we have not had to lay anyone off due to the introduction of robots."

How It Works in Helsingborg

The production line for small gear housings has two machining groups in which ASEA's (60-kilogram) industrial robots are employed--one for machining castings and one for machining steel for shafts.

The production group that handles castings has two subgroups, each with its own robot. In one machining group, two components of the gear housing--the gear cover and the plate--are machined. The robot controls three special machines that mill, drill, tap, and burr and a gaging station that remeasures the cover and plate in a total of 14 operations. This has reduced the number of manual operations to 6, compared to the 46 that were required when the work was done manually.

In the second machining group, one robot controls three special machines and a gaging station in a total of 11 operations for the machining of shields for the gear housings. The number of manual operations is now 4, compared to 36 before.

From those two casting machining groups, the gear housing components go to a washing station and then to final assembly.

In the first of the casting machining groups, however, a simple assembly and disassembly operation takes place completely mechanically. The industrial robot places the cover and plate in chucking fixtures, where they are automatically screwed together, then machined and gaged in five operations before being taken apart again to go to the washing line.

The machining group that turns the long shaft blanks into shafts for the gear housing's gear wheels also has an ASEA (60-kilogram) industrial robot for machine control. The robot moves and holds the shafts being machined in a crosscut-centering machine, a numerically controlled lathe, a keyway milling machine, and an NC grinding machine, as well as two gaging and testing stations.

11798
CSO: 3102/122

SCIENCE POLICY

PROVISIONAL PLAN FOR RESEARCH, TECHNOLOGY OUTLINED

Paris AFP SCIENCES in French 17 Dec 81 pp 1-5

[Text] Paris--The provisional plan for research and technology: An "unprecedented and immediate" research effort is envisaged by the 1982-1983 provisional plan for recovery of research and technology.

In fact, as Marc Albouy, head of the study and research department of the General Planning Commission, stated to the press, "it establishes the strategy that will make it possible, in the medium term, to be on a possible, necessary course, so that the national expenditure for research and development (R/D) will reach 2.5 percent of the gross domestic product (PIB) in 1985.

In order to attain this objective, the reporters of the plan believe that, "in spite of the outlay made by enterprises, it is not possible to prevent public financing for research and development from taking a preponderant part." Thus, civil financing of the administrations will represent, in 1985, close to 50 billion francs of the national expenditure of 80 billion francs. The state's outlay alone will, therefore, represent the equivalent of the present national expenditure. The present national expenditure is broken down into 30 billion in the public sector and 20 billion in industry." Nevertheless, maintenance of the share in research and development carried out by enterprises "is a necessity and the objective in 1985 is for this share to increase from 1.1 percent of the PIB today to 1.5 percent.

This objective will bring with it "a very considerable increase in the financial transfer by administrations to enterprises." Thus, if enterprises performed research and development in 1980 amounting to 30.2 billion francs and financed 21.7 billion, or a transfer of 8.5 billion in their favor--distributed among military administrations (4.9 billion francs), civil administrations (1.9 billion francs) and foreign orders (1.7 billion francs)--in 1985, if they perform research and development amounting to 48 billion francs (1.5 percent of the PIB) and finance around 30 billion of that amount, the financial transfer in their favor will amount to some 18 billion francs (in 1980 francs). In view of the military growth and anticipation of orders coming from abroad, it can be estimated that the net balance of the transfers between civil administrations and enterprises should amount to between 8 and 9 billion 1980 francs, or an increase of around 7 billion francs in 5 years.

There are several means of action for achieving these transfers, in particular large-scale technological programs and incentives for industrial research. The annual progression needed for this double objective is estimated at 26 percent, on the average. The plan puts much emphasis on the need for promoting a policy of bonus aids to the hiring of scientific personnel in enterprises and for giving priority to a policy of tax incentives for this same purpose.

In addition, banks and industrial enterprises will be encouraged to set up new innovation finance companies and risk capital companies.

In any case, basic research is not neglected, quite to the contrary, and Hubert Curien, chairman of the Technological Research and Development Group of the 2-year plan and, in addition, president of the the National Center for Space Studies, has insisted on stressing it. The plan provides, in fact, for "an improvement in means for basic research, which are going to increase by over 50 percent in 2 years with regard to operational credits alone." Better recognition should be given to the research activity of instructors and it should be better organized. During the 2-year plan, the reporters point out, reflection should be applied, in order to become better acquainted with the research activity of instructors in the universities, the large establishments of the specialized professional schools and of the IUT's [University Institutes of Technology].

Moreover, the plan recognizes the "absolute need" for increasing the number of researchers by 4.5 percent a year. Finally, a certain degree of acceleration of large-scale equipment is suggested.

It is observed that the 1982 research budget, which has just been approved by Parliament, agrees with the "course" proposed by the plan and that the scientific and technological programing and orientation law, to be submitted for examination by Parliament in the spring 1982 session, will undoubtedly be inspired considerably by the objectives and means appearing in the provisional plan.

In the opinion of Pierre Frederic Teniere-Buchot, head of the Future Planning Division of the former DGRST [General Delegation for Scientific and Technical Research], "many things should be watched. This is the first time that system analysis is used."

Thus, for example, the objective of 2.5 percent of the PIB has been established. It is obvious that, in order to attain it, it will difficult to deviate appreciably from the projections made. For 1982, it has already been determined. And for 1984, the number of variants will remain low.

In conclusion, the plan proposes some thematic observations on research and technology.

Among the research sectors to be improved, the plan believes that "a revival of the human, economic and social sciences," "a great effort in behalf of culture," and so on are needed.

In the field of health, research should favor four main lines"

[1.] Public health (epidemiology, sociology of health.

[2.] Biomedical technologies and logistics (biological and medical engineering, biological and medical data banks).

[3.] Clinical research.

[4.] Prevention, especially in the areas of nutrition, labor and highway accidents, alcoholism and nicotinism.

Research on aging (secondary disability with cronic, pathological disease of old age, medical consumption by the elderly), on mental illnesses and mental handicap, would deserve encouragement.

In the field of civil aeronautics, the plan proposes new investments pertaining to the national expenditure plan for research and development in 1985 corresponding to the objective established by the government depending on the growth of the gross domestic product envisaged up to 1985.

Two economic growth assumptions starting in 1983 were studied. One, an average of 3 percent over 4 years (1981-1984). The other, great growth averaging 3.5 percent over the same period. They lead to the following tables:

	1980	1981	1982	1983	1984	1985
Growth rate of the PIB in volume						
a. Low assumption		0.5	3.3	3.7	3.7	3.7
b. High assumption		0.5	3.3	4.6	4.6	4.6
PIB in billion 1980 francs						
a. Low assumption	2,754.9	2,768.7	2,860.1	2,965.9	3,075.6	3,189.4
b. High assumption	2,754.9	2,768.7	2,860.1	2,991.7	3,129.3	3,273.3

The following is the desired evolution for the DNRD [national expenditure for research and development] / PIB ratio:

	1980	1981	1982	1983	1984	1985
$\frac{DNRD}{PIB} \times 100$	1.83	1.89	2.05	2.20	2.35	2.50

Therefore, the following evolution of the DNRD in billions of 1980 francs is obtained:

	1980	1981	1982	1983	1984	1985
DNRD (projections)						
a. Low assumption	50.5	52.2	58.6	65.2	72.3	79.7
b. High assumption	50.5	52.2	58.6	65.8	73.5	81.8
Difference (a-b)	0	0	0	0.6	1.2	2.1

Calculation of the growth rates of the DNRD, in volume, leads:

Under the low assumption, to +11.1 percent in volume, on the annual average.

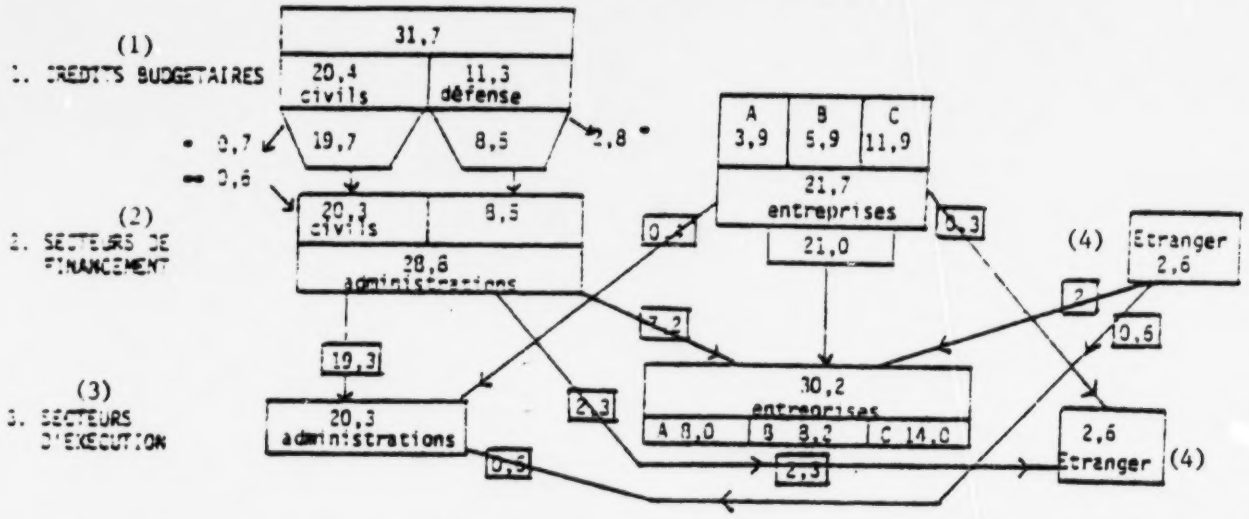
Under the high assumption, to 11.8 percent between 1982 and 1985.

The low assumption was decided on for the rest of the calculation. At any rate, the low degree of sensitivity of the result will be noted: around 80 billion 1980 francs, in 1985, with a relative error of ±2.5 percent.

The financial outlay, cumulative over 5 years, needed for increasing from 1.8 percent of the PIB in 1980 to 2.5 percent of the PIB in 1985 amounts to close to 60 billion 1980 francs. This amount relatively independent of the PIB growth rate shows the extent of the outlay to be made by the collectivity.

[Diagram and tables on next pages]

Year 1980 (in billion francs)



Internal Expenditure for Research and Development (DIRD) = 20.3 + 30.2 - 50.5 billion francs
National Expenditure for Research and Development (DNRD) = DIRD + National Financing of research performed abroad - Financing abroad of research performed in France = 50.5 + 2.6 - 2.6 = 50.5 billion francs = 1.83 percent of the PIB.

A: public enterprises
B: Groups capable of being nationalized
C: Other enterprises
(1) Status of statistical knowledge in September 1981
* VAT billed to administrations by enterprises and miscellaneous repayments
** Own resources of agencies deducted from public financing

Key:
1. budgetary appropriations
2. financing sectors
3. execution sectors
4. abroad

Estimate of 1982-1985 Expenditures

Milliards F. 1980 (4)	Années de Référence (1)		Plan de deux ans (2)			Horizon 1985	
	1980	* 1981	1982	1983	Accroissement Moyen Annuel (3) 1983/1981	1985	Accroissement Moyen Annuel (3) 1985/1981
DNRD	50,5	54,7	58,6	65,2	9,1 %	79,7	+ 9,8 %
FINANCEMENT INDUSTRIEL (5)	21,7	22,2	23,5	25,3	6,8 %	29,6	+ 7,3 %
FINANCEMENT PAR LES ADMINISTRATIONS (6)	28,8	32,5	35,1	39,9	10,8 %	50,1	+ 11,4 %
CP + DO (7)							
FINANCEMENT BUDGETAIRE DONT : (8)	31,7	36,4	39,4	44,8	10,9 %	55,6	+ 11,2 %
.FINANCEMENT MILITAIRE (9)	11,3	13,3	13,9	14,2	3,3 %		
.FINANCEMENT DES ENSEIGNANTS-CHERCHEURS (10)	3,2	4,2	4,5	4,9	8 %		
.P.T.T. (11)	1,1	1,7	2,1	2,3	16,3 %		
.AUTRES FINANCEMENTS CIVILS (12)	0,2	0,3	0,3	0,4	15,5 %		
.BUDGET COORDONNE PAR LE MINISTERE DE LA R ET T. (13)	15,9	16,9	18,6	23	16,7 %		
.EIR + PDT ET IRI) (14)							
AP + DO (15)							
FINANCEMENT BUDGETAIRE DONT : (8)	34,3	39,4	42,9	48,5	10,9 %	60,4	+ 11,3 %
.FINANCEMENT MILITAIRE (9)	13,1	15,4	15,5	16,3	2,9 %	17,3	+ 3 %
.FINANCEMENT DES ENSEIGNANTS-CHERCHEURS (10)	3,2	4,2	4,5	4,9	8 %	5,4	+ 6,5 %
.P.T.T. (11)	1,4	2,1	2,5	2,7	13,4 %	3,5	+ 13,5 %
.AUTRES FINANCEMENTS CIVILS (12)	0,2	0,3	0,3	0,4	15,5 %	0,6	+ 18,9 %
.BUDGET COORDONNE PAR LE MINISTERE DE LA R ET T (13)	16,4	17,4	20,1	24,2	17,9 %	33,6	% 17,8 %
.EIR + PDT ET IRI) (14)							

* Estimate after changing base.

Key:

1. reference years
2. 2-year plan
3. average annual increase
4. billions of 1980 francs
5. industrial financing
6. financing by administrations
7. [expansion unknown]
8. budget financing, including:
9. military financing
10. financing of instructor-researchers
11. Postal, Telegraph and Telephone service
12. other civil financing
13. budget coordinated by the Ministry of Scientific Research and Technology
14. [expansion unknown]

Estimate of 1980 Execution
(billion francs)

	(1) Par les Administrations	(2) Par les Industries			(3) Par l'étranger	(4) Financement total
	Civiles & Militaires (5)	Nationalisées (6)	Nationalisables (7)	Autres (8)		
Administrations Civiles (9)	15,8	1,2	0,6	0,4	2,3	20,3 40,2 %
Administrations militaires (10)	3,5	2,8	1,2	1,0	-	8,5 15,8 %
Industries nationalisées (11)		3,9	-	-	-	3,9 7,7 %
Industries nationalisables (12)	0,1	-	5,6	-	0,2	5,9 11,7 %
Autres industries (13)	0,3	-	-	11,6	0,1	11,9 23,6
Financement de l'étranger (14)	0,6	0,1	0,8	1,1	-2,6 / +2,6	50,5 100 %
Exécution totale (15)	20,3 40,2%	8,0 15,8%	8,2 16,2%	14,0 27,7%	DIRD= 50,5 100%	DNRD = 50,5 + 2,6 - 2,6

50 %

(16) Financement

43 %

Key:

1. by administrations
2. by industries
3. from abroad
4. total financing
5. civil and military
6. nationalized
7. capable of being nationalized
8. others
9. civil administrations
10. military administrations
11. nationalized industries
12. industries capable of being nationalized
13. other industries
14. financing from abroad
15. total execution
16. financing

TRANSPORTATION

ROBOTIZATION INCREASES AMONG FRENCH MANUFACTURERS

Paris L'ARGUS DE L'AUTOMOBILE in French 31 Dec 81, 7, 14 Jan 82

[31 Dec 81 p 3]

ROBOT CENSUS

[Text] Many Frenchmen are convinced that the Japanese automobile industry outclasses our own owing to an army of robots. This idea must be done away with and the fact loudly proclaimed that we have nothing to be ashamed of with respect to our own robots, either as regards their quality or their number.

A Myth To Be Exploded

A recent survey by the CSCA [Automobile Builders Syndical Chamber] counted, as of mid-1981, exactly 16,898 robots in service in Peugeot, Talbot, Citroen, Renault and UNIC [expansion unknown] plants.

This figure has now been greatly exceeded. But then, why is it that certain "experts" credit us with only 400 robots as compared with 50,000 Japanese ones? The answer is simple: We are not talking about the same robots! While for the French the "robot" is a state-of-the-art machine, highly developed and performant, the Japanese bestow the term "robot" on what to us is a mere automated machine... Using the Japanese terminology, we have at least 17,000 robots (compared with their 50,000) of a quality equal to and in certain domains (recognition of shapes, shapes, smelting, etc) superior to theirs.

Peremptory affirmations of our mediocrity have created a wave of panic in the public mind. However, after having visited the plants at Mulhouse (Peugeot), Billancourt, Douai, Flins (Renault), Poissy (Talbot), Charleville and Velizy (Citroen) and interviewed, over the past 7 months, the builders' technical managements, we can assert that, thanks to our robots and a number of other factors, our industry is now regaining its competitiveness on the world market.

To Have Done With It...

It is worth pointing out that Japanese industry has broadened the meaning of the term "robot"...to benefit to a greater extent from the bonuses and tax advantages

offered by its government as an incentive to modernization of the country's productive apparatus. (In fact, why has not the same thing been done in our own country?). At the risk of sounding as though we are "cock-a-doodling," we would also point out that the Japanese automobile builders' plant equipment, installed between 1960 and 1970 during the worldwide automobile boom, will be modernized now at a slower rate, enabling us to catch up with them. Added to this is the interest currently being shown by the Japanese in certain French robotics techniques, which are far more advanced than theirs...

To put to rest once and for all the psychological aspect of the problem, we shall mention what the "Japanese obsession" has produced of a positive nature. The facile thesis of low costs owing to the low remuneration of workers or exploited subcontractors, and to hellish production rates, has definitely run its course. A revaluation of the yen and a price rise on the European market were all it took for us to realize "that we were not all that far ahead of them," and that their manufacturing, and above all their management, methods--which we were convinced we knew and were equaling--were in fact superior to ours. Our "mea culpa" was rapid, and our reaction equally so: The erstwhile poor-copiers opened their doors wide to the French, who in turn lost no time in copying from them...and in improving whatever could be improved. Thus, a new kind of exchange was created--one less embittered by passions, and more durable and fruitful for all.

Classifying "Automatons"

There is little point in speaking of robots per se. They must be put back into proper context, namely, that of automation of production. Currently, they represent the summit of a hierarchy of machines, the first-born in the immediate postwar period, neatly grouped, according to the "Japanese" system of classification, into four categories, based on the method of programing used:

A. Manually controlled manipulator: A machine that reduces human effort or distances it from a harmful environment. Its programing is actuated by the human effort involved.

B. Fixed-sequence-controlled manipulator: A machine that operates according to a preset sequence (always the same motion(s)) that is not rapidly reprogramable. Many such machines, controlled by cams, templates or simple, hard-wired electronics, have been in use for several decades in our plants.

C. Programable-sequence-controlled manipulator: A machine whose preset sequence is very easily and rapidly reprogramable. At this level, the term "robot" actually becomes applicable: This category includes the numerous "painting" robots that can recognize different vehicles on an assembly line and spray their electrostatic paint (via mini-cups rotating at 40,000 rpm) in accordance with the shape they have recognized.

D. Learning manipulators: This is the highest form of robot, very often anthropomorphic in aspect (resembling a human), with shoulder, forearm, wrist and hand. It is programed by recording manually controlled motions and is capable of immediately repeating the motions thus "learned."

The Robot Concept

In this classification, the "European" definition of robot is clearly discernible in terms of categories C or D. Such a robot differs from the other manipulators (A or B) by four main functions:

1. Ability to learn a behavior pattern, a specific task, or a type of job--for example picking up one or several objects (or tools).

2. Ability to analyze, to perceive an environment, via sensors; this touches on the concept of artificial intelligence.

3. Ability to process the information thus gathered. The complementarity of functions 2 and 3 is evident, enabling the true robot to measure physical quantities, process them and compare them with typical values learned.

4. Possibility of modifying its "type" learning, hence the importance of "geometrical" control.

Though it cannot be called intelligent machinery (Wherein does its intelligence lie, although there is a certain grasp of relationships?), the robot does have, within the range of activities in which it is positioned, a certain autonomy of decision. It can adapt its intervention to the type of problem it encounters, but will refuse any activity outside the field of its acquired knowledge.

Multiform Robots

At the borderline, a case could almost be made for creating a B' category midway between B and C, for certain dually programed machines having a fixed sequence (its principal one) and a variable sequence. This primitive robot clearly has the appearance of an industrial automaton, quite antipodal to the "humanlike" aspect of a D robot. This is also the case of C "type" robots: How does one recognize a robot--educated to them as one is by science-fiction movies--in a series of "mini-cups" spewing out a fog of paint, or of traveling gantries equipped with spray guns, painting everything that passes in front of them...?

The "D" robots are characterized by:

1. Their morphology: Horizontal, vertical, telescoping horizontal, telescoping vertical, gantry, elephant-trunk vertical robots.

2. Their motive-power medium: For heavy loads (80 kg for Renault), a hydraulic-drive system is preferred, but wherever possible (around 40-50 kg for Talbot), electrical drive is preferred. For light loads--5-8 kg--everyone without exception prefers electrical drive.

4. [as published]. Their degrees of freedom: Let us take the most "picturesque" case--the 6-degree "vertical" robot--which also most resembles a human. The first of its six degrees is the ability to advance so as to approach the workpiece. The second is provided by the rotation of its trunk. The third, by articulation

of its shoulder, which permits its arm to rise or descend and which, combined with the first and second, enables the forearm-hand assembly to be brought up to the workpiece on which it will operate. The fourth, fifth and sixth degrees characterize the hand: up-and-down motion, right-left-right motion, and rotation of the wrist. On certain "elephant-trunk" robots, a seventh axis is added, giving it greater flexibility and enabling it to paint the interiors of automobile bodies.

5. Type of manipulation performed: This may involve parts (payload and volumes are of course taken into account) or tools or both: Certain robots position a part in place, then change their (pneumatic) part-handling "hand" for a tool "hand" (a welding one for example) and carry out their intervention. For reasons of efficiency, however, robots are being made more and more special-purpose.

6. In the very near future, a sixth criterion will have to be added, based on the capabilities of its sensors and the power of their software: Renault has introduced robots capable of recognizing complex shapes (TV camera, sonar) and of lining up parts in a given order. From the mechanical standpoint, these robots are no different from conventional manipulator robots, but "intellectually" (sic)--to finally use the term--they are far superior.

Learning and Animated-Drawing Techniques

Whether electrically or hydraulically driven, robots, mechanically speaking, are nothing more than machine tools: They obey the same laws of obsolescence and have therefore a useful life of 15-20 years. It would have been possible to build them as far back as the early 1950's; however, the electronic computer, which today weighs 300 grams, would at that time have weighed 30 tons (30 million grams!) and would hardly have been fast enough operationally...putting the robot outside the realm of profitability.

Today's microcomputer is at one and the same time the nerve system and the brain of the robot. How does it learn the work to be done? The method uses the animated-drawing technique in which drawings showing successive stages of a motion are photographed frame by frame on motion-picture film, so that when the film is projected at normal speed a continuous motion is produced.

1. By means of a "push-button box" resembling a conventional remote control and acting directly upon the robot, a technician causes the robot's members to move while breaking down the movement into constituent stages. All these operations are recorded on a magnetic tape. When this tape is run at an appropriate speed, the motion conveyed is rapid, continuous, but always precisely the same. It can be repeated hundreds or thousands of times (unless the cassette or program is accidentally erased), subjet only to the machine's durability (which must not be overestimated) and to proper management of wear and tolerances.

2. To gain time, the buttons have been replaced with a whiffletree, making the work of the learning-cycle technician easier.

3. To further gain time, a "jumping jack" is used. This device, in the case of painting, for example, has the same geometry (identity of segments, volumes and articulations) as the robot. A technician puts it through its motions in the most efficient manner possible; all the motions are recorded on a magnetic tape. When he feels he has perfected the operation, the cassette is inserted into the robot, which, a few minutes later, reproduces the best motions of the technician. It should not be thought that this easy: At Aulnay (Citroen), the painter did 1,000 automobiles before being satisfied! But how comforting it is to know that an exceptionally perfect human performance will become the robot's routine; the big winner in the game is the customer...but, concomitantly, the builder as well.

4. The computer can also be programed directly via a display console in dialogue with the robot; this is a much easier way to do it than it might seem to be...and offers great promise for the future.

Where Do the French Stand?

The survey conducted by the CSCA provides some useful information. Among the French builders there are 2,247 robots of the A type, 8,777 of the B type, 5,325 of the C type, and 369 of the D type. Precise data are hard to come by: Renault claims to have 200 type D among 8,000 machines, 4,632 of which are for automobile production, and estimates that PSA [Peugeot, S.A.] has about the same number; Talbot lays great emphasis on its in-house production of robots, its six new type-D robots baptized "Barnabe" and its numerous UTAP's [Programable Translational Units], classifiable as types B, B' or C and which have been in operation for many years; and at Sochaux and Mulhouse, so much secrecy surrounds robotization (which is nonetheless real, however) that a superb robot which removes engine blocks from the automatic injection presses and checks their conformity to specifications is, for security reasons, entitled only to the designation of "automaton"! At Citroen, on the other hand, the figures are ultraprecise: 650 type A, 950 type B, 1,350 type C and 50 type D are in service in the group's plants.

One fact comes to the fore: The robot population of our builders is highly performant (because it is recent!) and equitably distributed within the two groups. This will come as a surprise--the ransom price of the multiplicative effect of television--to those who think Renault is the only one that has robots in large numbers. It is also generally believed that the Regie is the sole manufacturer of automobiles that also manufactures robots, whereas, paradoxically, all the French manufacturers follow the same policy, as we will actually see later.

The Golden Age

In the trend toward automation of manufacturing processes, the robot is sometimes the best choice of the moment, but it will necessarily be so in the future. Citroen is going from 3,000 robots in 1981 to 4,850 by 1983; the others are increasing their robot populations in about the same proportions. The "sometimes" may come as a surprise to some, but contrary to the commonly accepted notion, it

is not necessarily true that the replacement of body-welding machines, for example, by robots is today the most economical choice. Once again, we must go back to the source--to the revival of automation and of our automobile industry, in 1945--for an explanation of this phenomenon.

World War II had seen the development of servomechanisms for radar management and control functions. With the return of peace, automation techniques came into widespread use in continuous process (oil refineries, chemical plants) but much less so in discontinuous processes. Nevertheless, progress was real and crowds gathered to watch the first transfer machines, the various automatons, the "multipoint" welding machines... A market in continual expansion made the automobile a "pull product" (a product that is "pulled" by the market, its producer needing only follow), and productivity underwent considerable development--a relatively easy process based on the series-production methods of that time--through rational juxtaposition of various devices: electrical, pneumatic, hydraulic, or mixed.

This golden age came to an abrupt end in 1972 with the first energy shock wave.

Death of the Dinosaurs

Overnight, the automobile became a "push product," a product that must be "pushed to sell"--that must be attractive, reliable, but above all, in constant evolution to preserve its allure. All of a sudden, production tooling was found to be monstrously rigid, incapable of reacting flexibly, and unsuited to the new era.

Fortunately, electronics and data processing are now providing support to the industrial sector and are able to impart indispensable flexibility to production techniques, through the use of universal machines that are smaller, instantly adaptable, and able to build several different models on the same assembly line. The dinosaur-like robots died as soon as their environment changed; the "multipoint body welders" are doomed. True, they are highly proficient; but they are enormous, costly, made in quantities of only one or two at most per model, and unable to produce more than one model. If that model is discontinued, the sumptuous machine cannot be adapted to the model that follows: It must be returned to the foundry!

With the life-span of models growing ever shorter--7 years today versus the 10, 12 or 15 years (sometimes more) of not long ago--the "multipoint" can no longer pay for itself.

The new robot, on the other hand, will produce at least two models, for a total life-span of some 15 years: A steelwork change to fit a new model will cost 50 percent less. A simple cassette change (a few minutes), a new control program, and immediately it is welding a new model. A "face lift" (a retouching of the front end) or a "restyling," should they be called for, present no problem: The robot (its software modified) easily adjusts to the slight differences involved. This important principle of "flexibility" granted, the massive entry of robots into production plants is justified by still other criteria.

Robot Welder = Quality

The irreversible nature of automation--hence its most advanced form, which is robotics--stems from requirements of threefold origin: technical, economic and social.

With competition playing its part, quality has become the main concern of the automobile builders; the development of automation contributes to it. The most striking example is that of the spot (induction) welding of bodies. The job of the human spot-welder is a hard one despite all efforts at electrode balancing; the slightest deviation from exact perpendicularity of the electrodes to the sheet metal is sufficient to prevent the "point" of fusion from being perfectly round and impart to it any of various "crescent" shapes. The duration of passage of the low-voltage current is generally well calculated as a function of the thicknesses involved; however, a melting down of the steel sheet(s) throughout the area of the "crescent" can occur. Furthermore, there being no certainty as to the precision (positioning-spacing) of the "spots," they are multipled, so that, in a worst-case situation, the assembly will still have the required strength.

With automatons, the problem is resolved: Precision is within 0.7 mm (Talbot), quality of the welds is regularized, and the number of "spots" can be diminished. One of the major advantages of the Japanese is that they have been able to bring the number of "spots" down to about 25 percent (around 1,000) of ours, and thus to reduce their costs accordingly...but Talbot, having already come down to 3.20 [as published] "spots" for the Samba, thinks Citroen can still do better!

Increased product reliability is therefore a direct consequence of robotization; however, it should be pointed out that, for certain small parts, the older automatons continue to be more viable...even though they cannot change from one fabrication routine to another as rapidly as the robots: The best example comes from Rennes, where 60 percent of the GS's spot-welds have been "automated," while 95 percent of the GSA's have been...but not necessarily thanks to robots!

Costly But Economical

A robot is by definition a "person who does not tire," who can work 24 hours a day, 7 days a week, without ever taking a vacation. The reality is much more complex, for fatigue and illness exist for machines as well, robots or not. This is in fact one of the criteria governing the choice of robots; at Poissy, had Anatole, the first robot to be built in-house, and its offspring, Barnabe, not reached a profitability threshold--1,300 "spots"/hr on 400-500 parts/day, and a 1-percent rate of outage time--they would no longer be in existence , nor would they have descendants.

If it is productive, the robot is above all flexible and enables production to be adapted to the evolution of the market, so that should one model "crumble" from the sales standpoint and another unexpectedly "take hold," overall production can continue at an identical rate. If the plant is unable to shift production rapidly from one model to the other, it will lose sales and revenues. Its

speed of reaction will moreover not depend solely upon its stripper, conveyor, transfer, welding, painter or even assembler robots. The entire workshop must be flexible. This requirement, this operational flexibility, demands the creation of hierarchical systems, of managing robots of a sort.

These are the least spectacular, but with them it is possible to save energy, reduce stocks, work out economical batchings, etc--in short, carry out with unprecedented speed the functions required to operate the production unit in the most intelligent manner possible. The "push-button" plant is no longer a myth. The Citroen foundry at Charleville is a perfect example. True, it is crammed with "conventional" robots they are all coordinated interactively at all levels. It is not a mere coincidence that Peugeot has made of it the pivotal point of its developmental work on foundries and that Japanese and Americans are buying certain patents...

[7 Jan 82 p 3]

SOCIAL FACTOR

[Text] The third factor in the irreversibility of automation is social. Had the energy crisis not accelerated the process, the need to improve working conditions would have produced the same result. All the automobile makers are determined to eliminate heavy, difficult, repetitive, hazardous and unhealthy work. The safety of human workers can be vastly improved, though it will never be total regardless of the precautions taken. The definitive solution, the only sure one, is to perform these jobs...without human intervention. Were not the first robots handlers of cumbersome, bulky, heavy and sharp-edged parts? Robotics is making its most rapid advances in foundries (not the machining of parts, for which conventional transfer machines are best suited), iron and steel work, welding, and painting (priming,PVC undercoating of chasses). Personnel working close to robots see their jobs being redefined and more often than not enhanced. The reorganization of work, in symbiosis with robots, clearly marks progress.

Every coin, however, has its reverse side, and the advantages of robotization--its technical, economical and social ones--generate problems in these very domains.

Adapting

Changing the structures of a plant or reconverting it, when possible, is not a minor undertaking. The remarkable "gate-line" assembly lines at Poissy are not robotizable! On the other hand, the Citroen plant at Aulnay was designed with eventual robotization in mind. Not knowing exactly what shape those robots will take, the architects have left vast open spaces to accommodate them... that in the meantime represent a burdensome investment!

Vehicle design techniques must also adapt. A robot can be made to do a great deal; but the simpler its job is made, the more efficiently the robot will perform it. At Douai, during the setting up and adjustment of the R-9 assembly lines, the work of the robots could be compared with that of the personnel working on the R 14. For the same work (joining up the rear body subframe), the robot welded "in line" whereas the human workers had to perform a number of difficult "backstep" welds. For each visible improvement coming out of the design

stage, off the drawing board, there are many others--methods of bending the metal sheets, of assembling them--that are equally important, without forgetting the improved quality of the spot-welds and the reduction in their number. Thanks to the robots, the reduction in production costs, in the final accounting, is placed at around 20 percent.

Costly Robots

On the other hand, certain robots are not directly profitable. This is the case of those made necessary in order to improve working conditions. For some other kinds of production work, their arrival is not being looked forward to, a good transfer machine being far more productive than an army of robots! This points up an important concept: The robot is not a panacea; its profitability is not necessarily greater than that of existing machines, for although it is rapidly amortized (2-2 and 1/2 years) under optimalized conditions, its purchase price is high.

An assemby robot costs (on average) Fr300,000, a painting robot Fr400,000, a welding robot Fr500,000-600,000, a figure that must be practically doubled (80-100 percent) to include the acquisition of its environment.

It must also be considered that a robot can only perform a few spot-welds. At Poissy, the four robots on the Samba subframe assembly line perform 90 spot-welds versus 174 by the automatic machines and 58 by human workers. With time, this proportion will shift toward elimination of the human contribution, but that of the robots will not exceed 50 percent.

In any case, for welding operations, a large number of robots -- and a costly investment--must be envisioned. And since the robots currently available on the market are far from being as universal and reliable as might be imaginable, our builders are being understandably cautious in their selection and thorough in their testing of such equipment...and are building their own in cases where they have not succeeded in finding the rare bird they are seeking!

And What About Unemployment?

From the labor standpoint, the replacement of workers by robots can be summed up simplistically by the statement: The robot reduces the number of employees. To this, those who have some experience in the field reply: Not assuredly. And they easily justify their position.

The first important fact is that, more often than not, robots replace systems that are already automated! In 1969, 50 percent of the R-5's spot-welds were automated. By 1980, this ratio had increased to 82 percent, of which 72 percent was being done by multipoints and 10 percent by robots (in the case of the R-9 and the Japanese vehicles, this proportion is 90-95 percent). From this experience, Renault has drawn the following conclusions: To produce 1,000 R-18 floor assemblies a day requires a staff of 81 workers, whereas for the R 5, whose fabrication is less automated, the production of 1,000 floor assemblies a day

requires a staff of 115 workers. At first glance, one might hastily deduce the disappearance of 34 jobs--an erroneous conclusion since, at the same time, the quality assurance and assembly line maintenance services for the R 18 were increased. In optimum cases, the overall staff has remained constant; in some others, it has even increased!

Conclusions, however, should not be drawn from this state of things, which after all is transitional: When the breaking-in and adjustment period is finally completed, the job-elimination problem, momentarily in abeyance, will resurge.

What is certain, however, is that the fabrication/maintenance ratio will never again be the same: Of every 100 persons involved in steelwork on the R 5, 11.4 are in maintenance jobs, versus 17.4 on the R 18, which is more automated.

Citroen confirms this situation, comparing an old foundry, at Clichy, with a new one, at Charleville. At Clichy, of every 100 persons, 60 are engaged in fabrication, 26 in maintenance, and 14 in technical services, versus 47, 30 and 23 respectively at Charleville, it being understood, of course, that the 47 at Charleville produce as much as the 60 at Clichy.

The Robot and the Social Factor

From the standpoint of qualifications, a corresponding shift toward skills at the upper end of the scale is evident. Of every 100 persons at Clichy, 84.3 percent are laborers, 15.1 percent are staff employees, and 0.6 percent are supervisory employees; at Charleville, these proportions are 74 percent, 24 percent and 2 percent respectively.

Those in the factory labor categories are, as a result of the higher-grade equipment being put at their disposal, also not immmune to this upward displacement of skills: At Clichy, there are 38 unskilled for every 62 skilled laborers; at Charleville, 33.5 for every 66.5, respectively.

From the social standpoint, the effect of robotics will be to:

1. Reduce the number of jobs in the automobile sector (even though it will create more jobs outside it, in the robot-buiding sector).

2. Increase the displacement of skills toward the upper end of the scale.

3. Reduce the proportion of unskilled laborers.

4. Increase the number of permanently employed highly skilled workers.

5. Increase the proportion of production maintenance specialists (including many data processing specialists, which is new), as well as of technicians and engineers.

Between 1950 and 1975, these phenomena, already very real, did not bring about a drop in "direct" employment in the automobile sector: Expansion of the sector

was so explosive that it snuffed out the problem. The Regie expects the disappearance of 12 jobs per 100 at the "Faire" level beginning in the 1990's, for an equivalent productive output, "but it is self-evident that the development of automation is based on the prospect of a substantial increase in production." While optimism prevails at Billancourt, a wait-and-see (or realistic?) attitude is the more evident at Peugeot S.A., where the feeling is: "it is practically impossible to judge the effect of robotics on our employment level."

A secondary--but highly important--effect is that this rise in the level of skills is based on vast programs (and costs) of training. Centuries and technologies are not easily turned round, as Renault well knows, having financed 240,000 hours of recycling in 1980!

[14 Jan 82]

FRENCH-MADE ROBOTS

[Text] The French automobile makers absorbed the robotics "shock wave" very well and reacted intelligently: "We cannot adapt our production tooling to the situation overnight, so let us take a gradual approach, one of selecting the best available equipment."

This very approach, however, actually led to diametrically opposite results. At the time, only Renault had a world standing, the means and the engineering know-how to design and build its own robots, better ones in fact (because better adapted) than those available on the market. This policy of independence and of mastery of the automobile "process" is today bearing fruit, in that Renault has resolved not only the technical but also the economic aspects of the problem. The Regie designs, and has its subsidiaries build, excellent "top of the line" robots (an 80-kg gripper) and "bottom of the line" ones (30 kg, 15 kg, 8 kg) that respond perfectly to its needs...and to those of the other makers. However, it intentionally forgoes the "central" niche in the market, where the "know how"--and prices--of competing products are unbeatable. The recent creation of a subsidiary (Cybotech, with Ransburg) in the United States shows that Renault has mastered these technologies perfectly and is now seeking to turn heavy development costs into profits through exports. Nevertheless, at Flins, only 9 out of 10 robots on the R-18 assembly line are of in-house design and construction: It is continuing to apply the binding principle of selection, based on profitability, of equipment.

With respect to everything that is strictly "production of automobiles," Peugeot and Citroen have found robots at attractive prices and on this basis have no intention of giving up their independence of action in search of productivity. They have therefore not developed their own in-house techniques...although they can be said to have done so in certain cases. Their Asea (Swedish) robots, for example, have been adapted to continuous arc welding (a Citroen patent): Thus, a totally commonplace robot has become an ultra-proficient machine, unique in the world. For its foundry, nothing was available: The Charleville plant was therefore designed from A to Z "in-house" and its organization as well as its robotization are currently the envy of many.

Barnabe

Talbot--Chrysler at the time--had made an early start on automatic welding machines, some of them with dual grippers: They are extremely practical, economical, and can operate during human intervention. The need was felt for "something else" in welding machines, however, the Unimate robot of that time (1973) being nothing more than a mere "handler of materials." The first approach was to eliminate the hydraulics (not clean, not simple, more fragile than it had appeared to be); next, Anatole was created--a heavy-duty, 6-axis (electrically driven) robot that, from 1976 onward, functioned entirely satisfactorily on the 1307-1308 line; and then, in 1978, the Horizon.

Its offspring, Barnabe, is a 6-axis (one translational, five rotational), "fully electrically driven," each axis being powered by a direct-current motor. With its incremental coder, its thyristor regulation, its microprocessor control system, eight programs, 40 kg "at the gripper" (capable of increase to 50 kg), and 20 mkg of wrist torque, it is clearly not universal, but it responds perfectly to the needs of Talbot.

At Poissy, excellent arguments are advanced to justify this choice. The advantage of "in-house" fabrication is that it avoids accelerated aging--the aging built in by the manufacturer to ensure future sales of new equipment (true also in the field of data processing). A second "plus" is total independence: With the assemblers of new foreign equipment spread as thinly as they are, difficulties have at times been experienced in clearing equipment failures. With Barnabe, French-built even though the Inland motors (military specifications, U.S. license, Irish manufacture) and reducer drive gearing (FRG) are foreign-made, there is the assured availability of a reliable product, a not very expensive one (each of the six robots costs Fr500,000), and one that lends itself to future development. The third of three advantages is that solid maintenance personnel is trained at Poissy itself, which perhaps explains Barnabe's excellent record of reliability.

The Future

The group factor also favors Barnabe. A unit was recently shipped from Poissy for an evaluation at Sochaux, and then to Citroen (at Velizy, where a Kuka welder is currently being tested), to be returned "fully used and proven" in May. Does this mean that, in the more or less distant future, Peugeot S.A. will become its own supplier of robots? That would be going a bit fast, for the group's policy is still "Buy the best there is." To this effect, joint procedures have been worked out that are to be applied with equal rigor to Barnabe. This having been said, it must nevertheless be said also that there is no hesitancy about buying from Renault, as attested by Citroen's welding robots at Vigo: Always buy the best there is...

At Renault, plans are as realistic as they are grandiose and concern the designer as much as they do the user of robots. The Douai plant has surpassed the Japanese, in that, in addition to its 125 welding robots, it has "assembler" robots that assemble the R-9's power plant, brought by 110 wire-guided carriages, on the

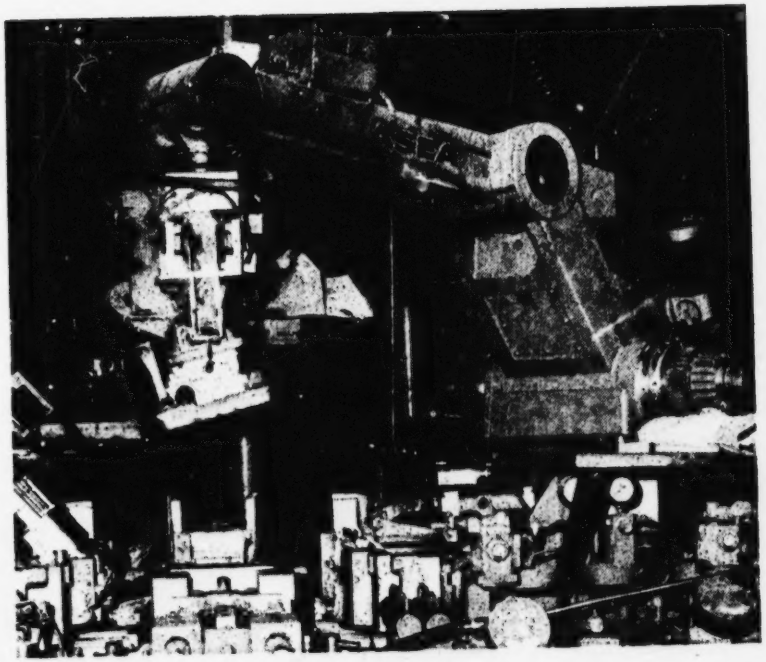
body shell. This is a worldwide "first," in that a robot had never until now "manned" a production-line assembly station. Very soon, however, this feat is to be carried much further. At Billancourt, we saw a robot assembling transmission gearboxes! The machine, a definitely very simple one from the mechanical standpoint, designed for Cleon and Spain, took 3 years to perfect: It stacks bearings, gears and clips on the secondary shaft, without a mistake and with extreme reliability. It functions only, however, by taking the parts on a small carriage with four vertical pins, making it necessary for someone to prearrange the parts in proper order. In the near future, the latter operation will be performed by a robot! The Regie has done a great deal of work on small manipulator robots capable of recognizing shapes, hence to perform such functions. A large 80-kg robot is even equipped with an optical system (a TV camera) backed by a sonar. A sophisticated analysis of images by the robot's software enables the robot to determine how the crankshaft blanks are arranged (on a pallet) and at what point they can be gripped to place them on the conveyor of a transfer line.

Better yet, by improving still further their sensors and softwares, robots can handle parts of greater complexity and even eliminate defective ones... Such investments could appear to be not economically viable; this, however, would be losing sight of the fact that robotics has as one of its objectives the elimination of nerve-wracking repetitive tasks.

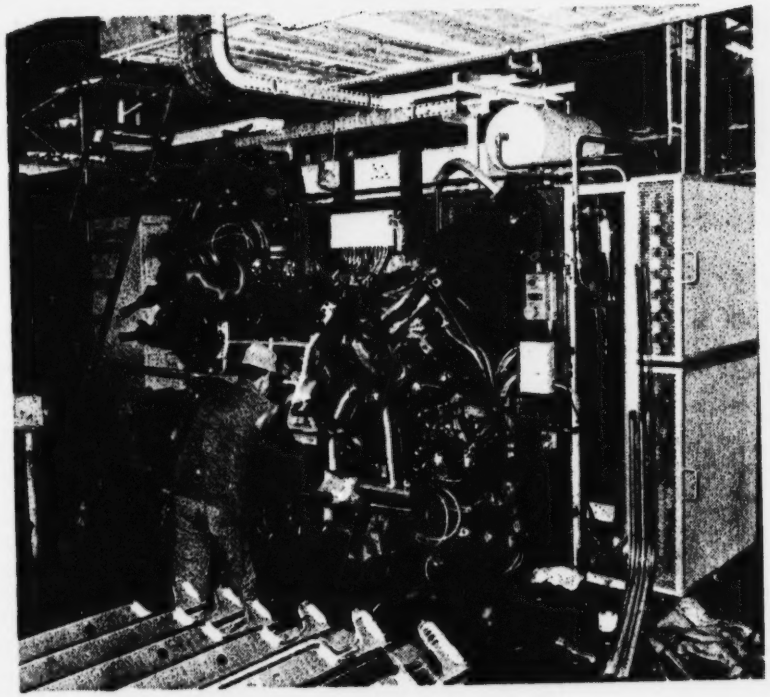
By Way of Conclusion

This third generation of robots, in the light of the growing complexity of the jobs it can perform, is evidence that we are as yet in the prehistoric era of robotics! The designers say they are still being hampered by the slowness of their computers, but this obstacle is due to disappear shortly: This is being worked throughout the world and above all...in Japan. Be that as it may, Renault has become one of the world's leaders in robotics. Peugeot S.A. could rank next to it, were it not that it finds it simpler to build only those few robots it is interested in building and to buy elsewhere--at times from Renault--those it deems the best available. One thing is certain: All our automobile makers use robots judiciously, from the economic standpoint as well as from the social one. Q.E.D.

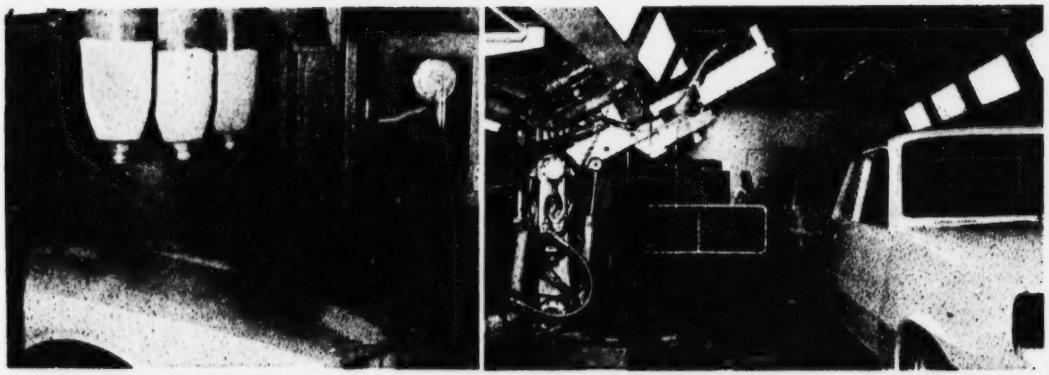
[Photos follow]



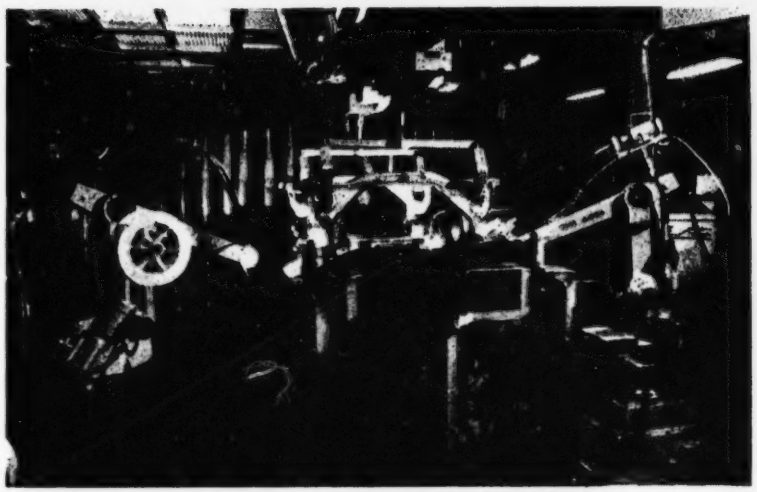
[Left] An arduous environment? The robot takes over from the human being. At Charleville, a robot does the "stripping" of Citroen engine-block castings.



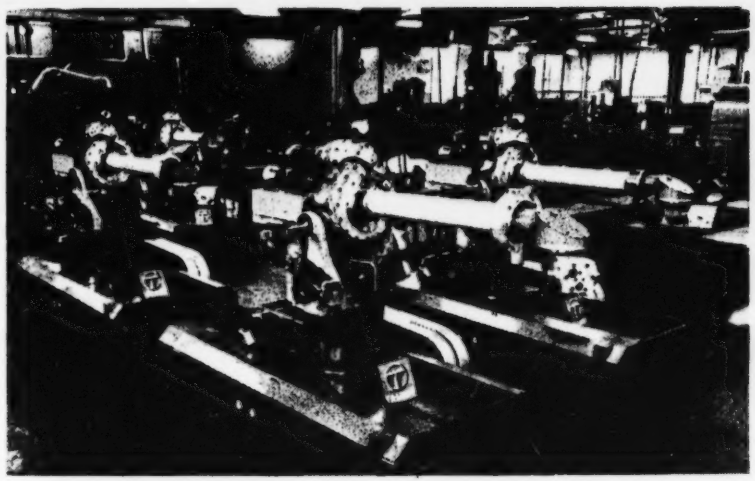
[Right] The multipoints: Economical but doomed. At Poissy, a multipoint welder for the side panels of the Samba.



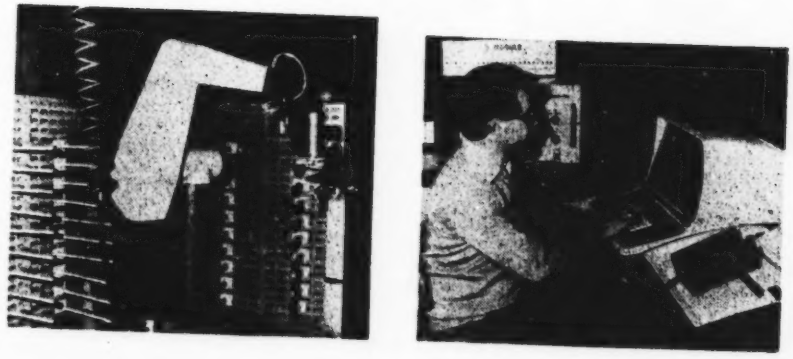
[Top] The robot to the aid of man for hazardous work: These "mini-cups" [left] at Citroen's Aulnay plant are a robot painter, as is the "elephant trunk" [right] installed at Flins.



[Above] Citroen: Two "run-of-the-mill" Swedish robots, transformed by Citroen into world "firsts." They make continuous arc welds.

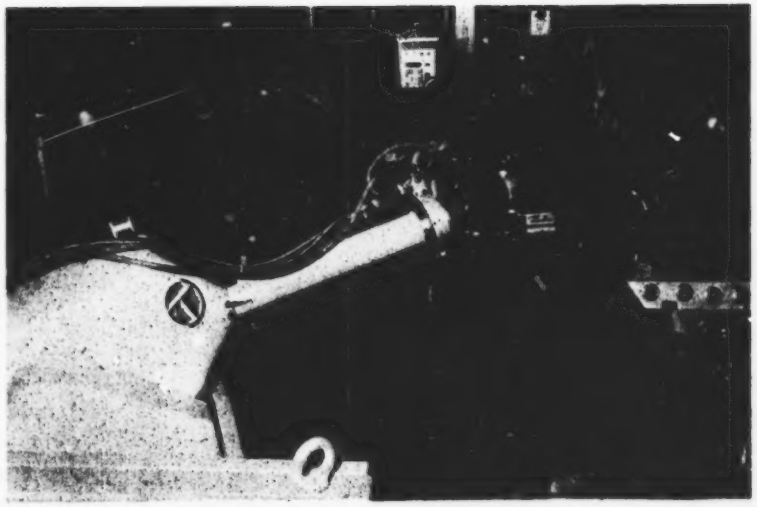


[Above] Talbot's "Made in Poissy" robot, Barnabe. Designed and built in Poissy, these robot welders are being tried out by Peugeot S.A.

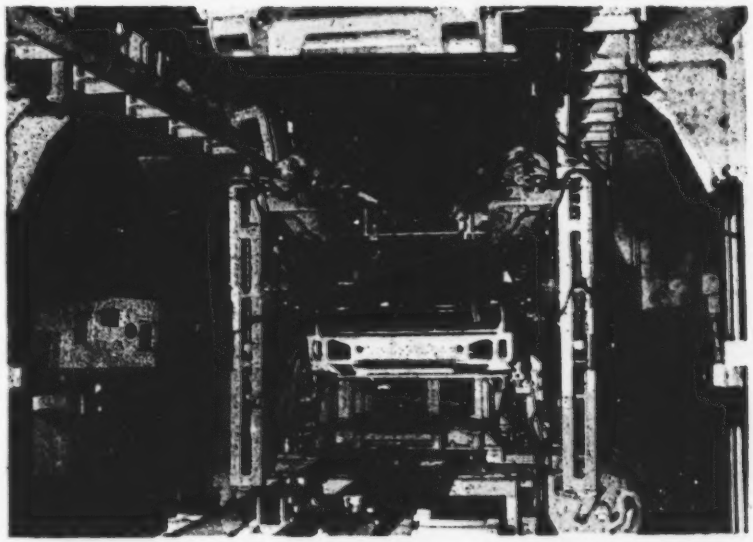


[Above] Citroen in the vanguard: This little Unimation robot [left] picks up a windshield, puts an adhesive glazing to it and returns it to a container. It is programed directly from a display console [right].

A salute to electronics! This robot represents the creation of a job in electronics and data processing.

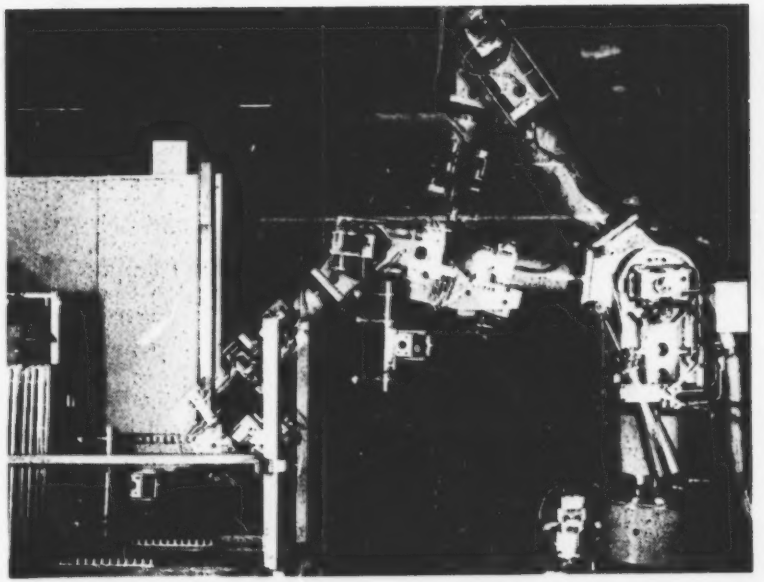


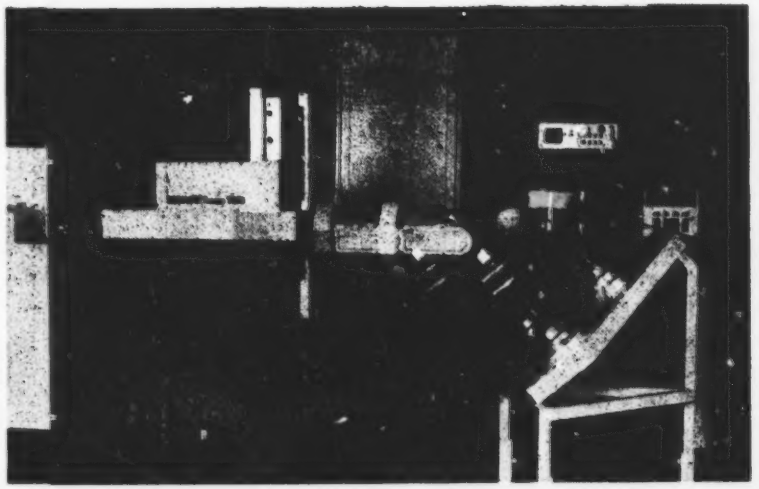
[Right] Barnabe: Easy maintenance and independence. A Talbot challenge to robotics experts that will benefit Peugeot S.A.



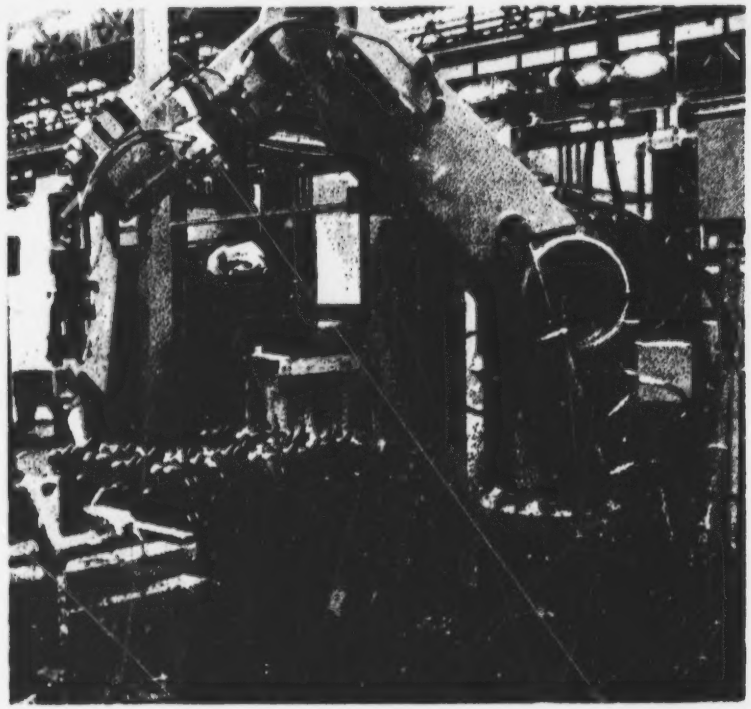
[Left] At Vigo, Citroen has adopted a Renault gantry-type robot painter for its Visa.

[Right] Smart transfer robots: A Renault 8-kg, electrically-powered robot keeps assembly lines supplied with parts.





[Left] Reliable transfer robots: This Renault 80-kg, hydraulically-powered robot can arrange parts in containers.



At Renault, the robot has acquired vision and the sense of touch. This electronic robot will be going to Cleon to unload crankshaft blanks.

END

JPRS 80197

26 February 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 94

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JPRS 80197

26 February 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

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ELECTRONICS

TWO-STAGE PLAN TO AID ELECTRONICS INDUSTRY

Paris L'USINE NOUVELLE in French 7 Jan 82 pp 23-24

[Article by Eric Le Boucher]

[Text] The continuation of the first plan for components was already being prepared before 10 May. The new government will give it an incentive because it considers it as an essential part of the electronics industry. With this in mind, it will speed it up and expand the allocation of aid beyond integrated circuits.

The Ministry of Industry would have preferred to wait six months to a year before deciding on the second plan for components. The first four-year plan, which was started in 1978 will end late in 1982, and "it is still too early to judge its results." The three major plants (Thomson-Efcis, Eurotechnique, and Matra-Harris) have still not completed their scale-up, nor realy found their place in a depressed European market. The ministry also wanted to await the nationalizations and the nomination of the general administrators to define the plan in concert with the new general staffs.

No Upheavals in Role Assignments

But pressures "from above" (it is known that the President of the Republic himself, attaches great importance to integrated circuits) have forced a speed-up: a compromise had to be found. An interministerial council will meet at Matignon around 13 January to complete an interim project which will only cover 1982; the "true" plan will be issued during the year.

The first plan will be continued during 1982: no great changes in major assignments. The agreements with American companies (Saint-Gobain-Eurotechnique with National Semiconductor, Matra with Harris and Intel, Thomson with Motorola) are maintained, and will be maintained in the future.

However, with the nominations of general staffs, a coordination will be studied in the major nationalized companies to eliminate duplications ("Is it reasonable in France, to finance three teams for an 8-bit microprocessor?" the Ministry of Industry asks itself), and to eventually modify some structures. The government wants to encourage larger international associations. Everyone thinks of Europe.

The "true" plan is for the most part defined. Matignon now has to arbitrate the budgets, which will be "at least doubled," and probably increased even more (the first plan had cost 800 million francs over a period of four years). It will have two objectives: move even faster in industrial investments and research; and expand (beyond integrated circuits, government aid will for instance cover passive circuits, hyperfrequency, connection technology, and such other technologies as ceramics). With the strategy of biting into the market growth rather than into the strength of the competition.

The expansion will also cover equipment assets for components (which was expected) and associated services (which was less expected). The government will assist the creation of circuit design and product testing. In a larger sense, the thinking in terms of "industry" which guides the industrial policy will lead to a search for better correlations between component production and their sale in all user sectors. And that does not apply only to telecommunications.

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CSO: 3102/135

DANISH RESEARCHERS WORK TO DEVELOP SUPER BATTERIES

Copenhagen BERLINGSKE TIDENDE in Danish 18 Jan 82 p 5

[Article by Jens J. Kjaergaard]

[Text] There is a prospect that the Danish Technical College will become one of the leading universities in Europe when it comes to research work in the area of batteries. Chemical Laboratory A is conducting studies that could lead in the long run to the development of lightweight but still very efficient and rechargeable batteries based on salt melts or in other words the electrochemical storage of energy. Subsidy funds have been provided for preliminary work. Over a 2-year period the State Technical-Scientific Research Council, which has just received a report on the possibilities, granted about half a million kroner for this research.

The laboratory has been studying the chemistry of salt melts for many years under the leadership of assistant professor Niels Janniksen Bjerrum, MS, especially aluminum and sulfur compounds. Both these elements are potential possibilities for electrodes in batteries with high specific energy.

Free Research

On Friday Niels J. Bjerrum will defend a technical doctoral thesis on salt melts, "The Chalcogenes in Chloroaluminate Melts." The thesis describes their properties, balance and the techniques developed for the studies. These involve high temperatures, considerable steam pressure--and extended periods of time.

"This is basic research but the leap to practical application is not great," Niels J. Bjerrum told BERLINGSKE TIDENDE. "At DTH [Danish Technical College] we are now working on the batteries--and we are just about to set up a small test facility on a laboratory scale for the production of sulfuric acid using a process that is an extension of my doctoral work.

"Aluminum, the most important metal in the world next to iron, can also be produced with new methods that save 30 percent of electrical consumption," said Niels J. Bjerrum. "Experiments are being conducted by the big Texas company, Alcoa.

"As far as I can see all this goes to show that the dividing line between basic research and applied research is often artificial. A requirement for political control of science would probably lead to fewer discoveries being made. Research workers must have the freedom to get things started even though their usefulness is not always immediately apparent. Just imagine if 20 years ago a team of scientists had been assigned to find a better garbage can. They would probably have delivered a very functional container of iron without having considered plastic or paper."

Soaring Ideas

Niels J. Bjerrum was born in 1940. He received his Master's degree in chemistry at Copenhagen University in 1964. After that he spent 2 years in Oak Ridge, Tennessee in the United States with professor G. P. Smith. He learned the methods and techniques used in salt melts research so that he could continue in this research area on his own when he returned from the United States and was hired as assistant professor with Chemical Laboratory A.

"Incidentally the work at Oak Ridge was an offshoot of a project with a specific goal that was never carried out in practice. At one time there were incredible plans to build an eternally airborne nuclear-powered propellor plane with a light reactor that would be cooled by melted salt. It never got off the ground. But the ideas led to so many other things," said Niels J. Bjerrum.

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CSO: 3102/140

BRIEFS

COMES BUDGET INCREASES--The 1982 budget of COMES, which amounts to 309.5 MF, is 48 percent higher than that of 1981. Of this figure, 26 percent is allocated to direct solar technology, 25 percent to biomass technology, and 22 percent to study and dissemination activities. It is notable that: (1) A significant effort has been approved for the biomass development projects, mainly in the program for substitute biological fuels: the endowment of this sector will go from 50 to 80 MF, for an increase of 60 percent. This evolution will equalize the credit allocations for the direct solar and biomass sectors. (2) Dissemination operations, which were not truly started until 1981, will involve much higher amounts: 70 MF, compared to 31 MF in 1981. (3) The increased allocation for the international program supported by COMES from its own budget (16 MF instead of 11 MF in 1981) will make it possible to strengthen the COMES policy to complement the one carried out with credits from the Concerted Action Fund (FAC). [Text] [Paris SEMAINE DE L'ENERGIE in French 21 Dec 81 p 13] 11,023

SOLAR POWER PLANT DAMAGED-- According to the Alpes-Maritimes Equipment Directorate of Electricite de France, a violent wind, which blew in squalls on 19 December throughout the Mediterranean region, has seriously damaged the heliostat field of the Themis solar power plant at Targassone (Pyrenees-Orientales). The Targassone solar power plant (see AFP SCIENCES No 265 of 4 June 1981, pages 22 to 24) is an experimental installation which includes 200 flat-mirror heliostats with an area of 50 square meters, equivalent to a total reflecting surface of one hectare. Themis is considered as a solar-electric plant prototype for developping nations devoid of all other sources of energy. [Text] [Paris AFP SCIENCES in French 24 Dec 81 p 40] 11,023

NETHERLANDS: WIND ENERGY--The Dutch minister of the economy has allocated 32 million florins (72 million French francs) to wind energy research in the Netherlands. In a letter addressed to the Parliament on 15 December, the minister, Jan Terlouw, indicated that this amount will be used for the construction of a prototype large wind turbine (more than 1 megawatt of electric power) and a wind-powered electric generation plant which will be used as a demonstration project. The minister stipulated in the letter, that the studies undertaken indicate that by the year 2000, wind will be able to supply 2000 megawatts for the Netherlands. [Text] [Paris AFP SCIENCES in French 17 Dec 81 p 45] 11,023

CSO: 3102/133

GOVERNMENT REVEALS PLAN TO MODERNIZE MACHINE TOOL INDUSTRY

Paris L'USINE NOUVELLE in French 10 Dec 81 pp 82-83

[Article by Georges Le Gall]

Everything for numerical control (NC). That is the guideline of the plan proposed by Pierre Dreyfus for the machine-tool industry: research and development efforts, restructuring of the sector around specialized machines, and creation of foreign subsidiaries will be needed to prime a renewal. With the help of the government, of course.

On the day following the session of the Council of Ministers of 2 December, which examined and approved the development program of the French machine-tool industry, Pierre Dreyfus boldly defined the expected evolution--year by year, from 1982 to 1985--of French production and of the domestic market demand for NC machines (see tables).

We say boldly, because in disclosing detailed forecasts, should the goals not be met, the Ministry of Industry leaves itself exposed to conistant reminders that this new plan is a failure.

The fundamental idea of the program, revealed to L'USINE NOUVELLE last week (see No 49 of 3 December, p 66), is to very rapidly develop production and demand for NC machines. Thus, while the total French production of machine-tools in constant francs should grow by more than 75 percent between 1982 and 1985 (from 4.1 to 7.4 billion francs), that of conventional machines should decrease slightly, and that of heavy machinery should be stable; at the same time, the production of NC machines would almost quadruple (from 1.2 to 4.6 billion francs). This would correspond to an annual growth of 50 percent for NC machines, representing over 60 percent of the total value of French production in 1985, compared to 30 percent in 1982.

On the other hand, Pierre Dreyfus did not provide very detailed figures on the expected French foreign trade of machine-tools in 1984-1985. But he did indicate that the goal was to have a surplus in the balance of trade. First, by developing exportations, notably in industrialized countries: between 1981 and 1984-1985, for instance, foreign sales would increase from 30 percent to 50 percent of the NC lathe production, and from 5 percent to 30 percent of the machining center production.

Figures for objectives: expected growth in the turnover of the French industry (in constant million francs).

	1981	1982	1983	1984	1985
NC machines	1100	1200	1900	3050	4600
Conventional machines	1500	1400	1400	1350	1300
Heavy machines	1500	1500	1500	1500	1500
Total	4100	4100	4800	5900	7400

Source: Ministry of Industry

Projected development of NC machines on the French domestic market (in numbers of machines).

	1981	1982	1983	1984	1985
Lathes	1000	1000	1340	1800	2400
Machining centers	250	350	550	1100	1500
Milling machines	250	250	380	590	750
Other machines	500	500	610	735	900
Total	2000	2100	2880	4225	5550

Source: Ministry of Industry

Secondly, by recapturing the domestic market: during the same period, the share of importations in the total French demand would decrease from 60 percent to 30 percent for NC lathes, and from 70 percent to 35 percent for machining centers. All of it without protectionism, thanks to a French industry which becomes competitive once more.

These ambitious objectives should be attained primarily through development contracts between the government and some 15 enterprises. In exchange for public support, these enterprises would pledge to specialize in a given line of products, standardize components, devote about 5 percent of their turnover to research--part of which will be subcontracted outside organizations, train and hire highly qualified personnel, and increase their business in France and abroad.

An Investment of 4 Billion Francs

As an overall figure, the three-year (1982 to 1984) investment involved in the renewal of the French machine-tool industry (recovery of private funds, investments, research and development) is estimated at 4 billion francs (which is the exact figure suggested by L'USINE NOUVELLE in its issue of 8 October 1981). This amount is equal to the turnover of the machine-tool industry in 1981, and represents about 25 percent of the business forecast for the three years 1982-1983-1984.

Of this total, 2.3 billion will be contributed by the government in various forms (loans, innovation support, industrial policy credits) from various ministries (Industry, Finance, Research, Labor). The Ministry of Industry estimates that shareholder contribution should amount to about 600 million francs. We must not forget that if the size of machine-tool enterprises is small (the three largest employ only 2000 persons each), the major enterprises (with the exception of Line) are part of large groups: Renault, Empain-Schneider (Ernault-Somua), Peugeot (Citroen), Suez (Hure), CGE (Graffenstaden), Snecma (Berthiez), Matra (Manurhin and Sagita), IDI (TMI), Gulf and Western (Bliss). The remainder of about 1 billion francs would be supplied by financial institutions.

The research and development effort for really new machines on the part of enterprises, which currently does not exceed 1 percent of the turnover, should quadruple to 200 million francs in 1984. A budget of the same magnitude should be available in technical and university organizations: the Center for Machine-Tool Study and Research, and the Superior National School for Arts and Trades will be in charge of machine design. The Agency for the Development of Automated Production will be responsible for the automation of production systems, and the Technical Center for the Mechanical Industries, will be responsible for material shaping processes.

Also during the 1982-1984 period, the modernization of production equipment should absorb 1.2 billion francs (or 8 percent of the turnover, compared to the current 2 percent). Both in terms of components (numerical controls, electric motors, speed controls, spindles, axles, and so on), and of complete machines, the goal is to achieve very high productivity gains, since it is expected that the actual number of employees in the sector (19,000 persons) will remain stable despite a very high production increase. While the number of low qualification jobs will decrease, that of assembly, repair, design, and supervisory positions will increase, implying a training policy for 2000 persons.

Aid Negotiated Case by Case With Enterprises

Each year, 150 million francs are allocated for the creation of foreign subsidiaries. But the development of exportations also implies agreements (acquisitions or capital participations) with foreign partners, notably in the United States, West Germany, and--why not?--Japan. The credits necessary for these operations are not included in the investment of 4 billion francs: in this domain, public support will be negotiated case by case with the enterprises.

To be effective, these efforts of research, productivity, and formation of networks abroad, assume a restructuring of the French industry. This requirement is now accepted. Since 2 December, one such modification has already occurred: Empain-Schneider will negotiate with Hure and CIT-Alcatel (subsidiary of CGE) to bring its Ernault-Somua subsidiary to a new group, directed by Hure, which would include Graffenstaden (machine-tool department of CIT-Alcatel). This new group would be diversified: it would produce standard models of NC lathes and milling machines, as well as machining centers.

The entire French machine-tool industry will thus change its aspect, since several other agreements are being planned; the present probabilities are:

Lathes: Cazeneuve, Ramo, Mechanical Innovation Company.

Milling machines: Dufour (recently reacquired by Profel) could enter into a new group under the direction of Vernier; Gambin (which is presently in the Line group) would rejoin this group or would enter into the group Ernault-Somua-Graffenstaden-Hure.

Grinders: the government is hesitating between a single group or a two-group formula. In the latter case, one would be formed under the direction of Constructions de Clichy (Renault group) with Gendron (currently in the Line group), and the other by such enterprises as Microrex and SIT.

Line would thus specialize in heavy cutting machines. Here again, the government is hesitating between one group or two. In the latter case, there would be an boring-milling machine group with Line and TMI, and a lathe group with Line and Berthiez.

Large presses: Bliss and Spiertz.

While granting that the decisions of 2 December prove that the government has finally decided to save their industry, and while admitting the usefulness of regrouping, the first concern of builders at this time is orders. A number of enterprises operate at only 50 percent of their capabilities and for 32 hours per week.

Given the 1981 drop in orders, the simple maintenance of the 1982 production at its 1981 level (an assumption made by the Ministry of Industry) already implies a renewal of orders, notably of orders from the domestic market. It is obvious that orders from the Ministry of National Education (which will amount to 400 million francs in 1982 and will remain at that level in 1983 and 1984) will not suffice as a solution. Nor will the investment effort expected from nationalized and nationalizable enterprises. It is imperative that the French industry as a whole begin to reinvest: but that is the whole problem of the relationship between the government and private industry.

Immediate Objective: Begin by Recovering the Delay

Even if the 1984-1985 objectives are achieved, we must not form any illusions: the French builders will only have recovered part of the time lost in recent years while their major competitors were progressing (Japan, West Germany, Italy, United States). Even if the goals are attained, the French NC machine production in 1984 will still represent only 7-8 percent of the world production (which at that time will be 65,000 to 70,000 machines, compared to 40,000 to 45,000 in 1980). The Japanese will still retain their 50 percent share of the world market in this domain. And the French inventory of NC machines will be only one-sixth of the Japanese one, while Japan's gross national production is only twice that of France.

Nevertheless, if these objectives are achieved, the French machine-tool industry will finally have become competitive and profitable. It will be able to pursue its development without government subsidies. But the machine-tool inventory of the entire French industry will have been extensively modernized: how does the government expect to reconcile the resulting productivity increases--which are absolutely necessary for French industry to be competitive--with the maintenance of employment in the industry?

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CSO: 3102/132

USE OF INDUSTRIAL ROBOTS INCREASING IN DENMARK

Copenhagen BERLINGSKE TIDENDE in Danish 1 Feb 82 p 2

[Article by Erik Bendt Rasmussen]

> [Text] Following a tough pioneer period an opening has been created for the introduction of robots in Danish industry. Estimates of the number of robots were too optimistic 10 years ago but now it appears that a new development is taking place.

Many more robots should be used in Danish industry. The entry of robots in firms has occurred much more gradually than anticipated 10 years ago. Now industry must be inspired to introduce more robots. For the first time Danish and international expertise on robots will get together on 3 February for a conference at the Technological Institute in Tastrup.

Industrial robots perform work that is monotonous and hazardous to human health. Today around 90 robots are functioning in Danish industry, engaged in spray painting, welding, assembly and handling. It was estimated 10 years ago that by the end of the 1970's about 800 robots would be operating in industry. The estimate was inaccurate. The market recession came and with it the fear that robots would take over jobs. At the beginning of 1981 only about 65 robots had been installed. But about 25 were added during the year. The attitude toward robots has changed very gradually. It has been documented that robots do not steal jobs.

The Technological Institute believes that the number of robots in Danish industry will grow by around 25 units annually in the next few years so that by 1985-1990 there will be from 250 to 300 robots working in industry.

Robots Learn Easily

The definition of an industrial robot is: "A programmable handling machine that without continuous supervision can carry out the positioning of tools or materials with reference to one or more fixed patterns of movement." The brain of the robot is of course a computer containing the program of work the robot is to perform. There are robots that in a manner of speaking can work on their

own. When the robot must learn to deal with something the operator only has to guide the robot's arm once. After that the computer remembers the movements.

In the early 1970's when robots began to gain ground opponents and organizations made prophesies and statements ranging from the entirely pessimistic to the totally ridiculous. Many firms shrank from buying robots because there was no expertise in Denmark and the firms themselves were ignorant of the technology. The picture has changed. There is a lot of experience today at the technological institutes, at DTH [Danish Technical College], the Welding Center and the Institute for Product Development, among others. For example the Technological Institute has three reports on industrial robots in Denmark.

"We are able to advise industries that are considering acquiring robots and we can use the robots we have at the Technological Institute to test whether productions are suitable for robots, for instance the painting of items. At the moment we are testing production for a factory that is considering buying a robot to enamel chairs," said engineer Bo Petri Jeppesen of the TI [Technological Institute] automation division.

It isn't done by simply buying a robot. A new system of production supervision must be introduced, the layout of the factory must be changed and a computer must be bought for the robot. In addition accessory equipment must be constructed. This is the equipment that conveys items to and from the robot and turns the items to fit the movements of the robot. Some robots have only a few arm motions, other types have more. Accessory equipment can often cost as much as the robot whose price is typically around 400-500,000 kroner for the more advanced types. Before a robot is acquired operating economy estimates must be made to see if the robot will pay for itself. Since it works quickly and continuously problems can arise with regard to room for the products and whether they can be sold as quickly as the robot works. And last but not least there must be talks with the staff on introducing one or more robots and training the people who will service the robot.

Where Robots Operate

Among industries having a robot is Danish Hospital Fixtures where a robot welds bedframes together. At Louis Poulsen & Co. robots spray paint parts for lighting equipment and at the Oticon factory five robots plate small wires and metal parts for hearing aids. In the plastics and foundry branch a number of robots are employed to remove hot items from casting equipment.

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CSO: 3102/140

SCIENCE POLICY

MINISTER PRESENTS BROAD OUTLINES OF NEW SCIENCE STRATEGY

Paris AFP SCIENCES in French 7 Jan 82 pp 1-2

[Article entitled "Major Guidelines of the Draft for an Orientation and Programmation Law for Technical Research and Development"]

[Text] Jean Pierre Chevenement, minister of research and technology, presented to the Council of Ministers on 6 January, the major guidelines of the future draft for an orientation and programmation law for technologic research and development. The minister had already presented a communication on this subject to the Council of Ministers on 23 December, but it had been relatively brief because the agenda was particularly crowded as a result of the Polish situation.

On 5 January, an Interministerial Committee on Research met at Hotel Matignon, chaired by the prime-minister, Pierre Mauroy. He was attempting to effect a number of budgetary arbitrations. However, as is customary at the end of such meetings, the communique was rather terse about the decisions that were taken, or those which could not be taken.

Attending this meeting in addition to Mr Chevenement, were Alain Savary, minister of national education, Anicet Le Pors, minister in charge of public functions, and Laurent Fabius, minister of the budget.

The communique of the Council of Ministers of 6 January specified the following points regarding Mr Chevenement's presentation:

This law will first of all establish the major directions of the research and technologic development policy, an ambitious policy from training to research; it acknowledges the specificity of research trades, whose general principles it will establish; the democratization of research institutions; the assertion of the role played by various regions; the valorization of French research for the benefit of the national collectivity, and the simultaneous inception of social progress in favor of research personnel; the importance of scientific information and technical education; and the development of international cooperation.

The law will specify the programmation of the major means to be used within the framework of these orientations, and as is customary for any multi-annual involvement, will take into consideration general balances.

The goal established by the President of the Republic, to bring research and development efforts to 2.5 percent of PIB (Gross National Product) in 1985, is a concrete expression of this ambition. Its achievement implies a significant increase in research and innovation efforts in enterprises, efforts which today are lagging far behind those of our major international partners; incentives will be used to this end; but the public research effort--supported by a vigorous policy of research personnel recruitment, which the Interim Plan indicated should grow at an average rate of 4.5 percent per year--will have to outpace and lead that of enterprises. Taking into account the provisions of the plan regarding the evolution of the other components of the public budget effort, the volume of the civilian R and D budget should grow by 17.8 percent per year.

The fulfillment of this objective will have to be examined each year so as to monitor the other components of the DRND (National Directorate for Research and Development). This effort will make it possible to simultaneously guarantee basic research, pursue the completion of the large programs of technologic development, and start on new topics, mobilizing programs that will combine basic research, applied research, and technologic development for large objectives of national interest. The goal is to provide France with the means of successfully carrying out the scientific and technologic revolution in all fields, and to make the country able to respond to the challenges of the future.

11,023
CSO: 3102/133

SCIENCE POLICY

ADOPTION OF 1982 BUDGET MARKS BREAK WITH PAST

Paris AFP SCIENCES in French 26 Nov 81 pp 1-7

[Text] On 19 November the National Assembly adopted the budget for research and technology, which amounts to more than 25 billion francs; according to Mr Jean-Pierre Chevenement, [minister of state for scientific research and technology], this constitutes "an effort for which there has been no precedent in over 10 years" and marks a "positive and decisive break with past trends."

For the minister, the 29.4-percent increase in his budget demonstrates "the willingness of the public powers to make the indispensable fresh start in research efforts, provided that industry's contributions reach 30 billion francs in 1982, as compared to 21.7 billion francs in 1980. With public financing, for its part, being close to 45 billion francs, there is good reason to believe that the national effort in research and technological development will reach 2 percent of the gross domestic product in 1982."

Mr Chevenement emphasized "the decisive role" which must be played by both public and private business firms, which currently are financing 33 percent of the national research effort (half of which is insured by nationalized and nationalizable business firms as a whole).

He felt, however, that this effort in the field of research by business firms was still insufficient in comparison with the results of other countries like the FRG and Japan, and consequently he hoped that this effort could grow in volume by at least 8 percent per year.

"To give industrial research and innovation indispensable second wind, a major asset will be available to us: the existence of a broadened public sector," the minister said.

For Mr Chevenement, national business firms "must take a leading role in the development of the channels of the future," such as biotechnology, mechanization, electronics, etc.

Mr Chevenement likewise insisted on the role which small and medium industries must play, and in this regard he indicated that he had asked that a study be done on "the means to be put into effect to overcome the obstructions which deprive "these industries] of the beneficial outcome of national research." He indicated that

fiscal incentive measures for developing research in business firms had been taken up with the ministers of the budget and of economy and finance. These measures could not, in any event, be applied before the 1983 budget.

The opposition criticized what it called "the witch hunt within the National Center for Scientific Research (CNRS)." "You asked for heads; so here is the decapitated CNRS," said Mr Claude Birraux (UDF-Haute-Savoie), while Mr Gilbert Gantier (UDF-Paris) affirmed that "no Marxist science existed." The minister of research indicated that he "wanted to put an end to the myth about heads chopped off: there has not been any cutting off of heads. They flew off by themselves; it was a spontaneous movement."

"After years of smothering, suffocating, witch-hunting, we want to install pluralism. I do not know what Marxist science is, but I know very well what goods are hidden behind anti-Marxism. I am in favor of tolerance."

For his part, Mr Guy Hermier, Communist deputy from Bouches-du-Rhone, wished that "profit-motivated steering, a sinister reminder of Giscardian ways, could be replaced by a stimulation toward research and innovation motivated by social and national needs and their democratic expression."

In conclusion, Mr Jean-Louis Masson (RPR-Moselle) made a speech in defense of the use of the French language in the field of science.

Here are the major excerpts from Mr Chevenement's speech:

Regarding the overall effort by business firms:

The objective which the government set for itself of bringing the internal expenditures for research and development up from 1.8 percent of the gross domestic product in 1980 to 2.5 percent in 1985; i.e., of bringing these expenditures up from 53 billion francs in 1980 to 80 billion (in 1980 francs) in 1985, implies a major effort by all partners in research, business firms as well as public organizations. Here I should like to insist on the decisive role of business firms, which are currently financing 43 percent of the national research effort--half of which is insured by nationalized and nationalizable businesses as a whole. It has to be known that the portion of research financed by industry--0.8 percent of the GDP--remains lower in France than in the countries of our main partners, especially Germany and Japan, where it reaches 1.2 percent.

Work carried out on the occasion of the preparation of the two-year plan showed that the effort of business firms should grow in volume by at least 8 percent annually if the objective which we have set for ourselves for all of the internal expenditures for research and development is to be reached.

In this case, it is a matter of an effort well above the growth of the gross domestic project.

Thus, not only must the research and development effort allowed by business firms be maintained--it would be against their interests, because of temporary difficulties arising from the recession, for certain businesses to reduce their expenses for research and development--but also this effort must, in fact, be greatly increased.

To give industrial research and innovation indispensable second wind, a major asset will be available to us--the existence of a broadened public sector.

National business firms will play a driving role in the development of the channels of the future (biotechnology, mechanization, electronics, etc.); acting within the framework of plan agreements ensuring their autonomy, they will have to grapple with the long-term preoccupation, just as decisive for their future as it is for that of our country. I am likewise counting on them very much to conceive and carry out original means of collaboration with public research laboratories on the one hand, and with other business firms on the other.

Finally, I hope that large national business firms will actively participate in disseminating throughout the industrial field as a whole--particularly among the small and medium industries with which they work--the knowledge which they have accumulated over time and the techniques at their disposal. I shall ask some of them to start up pilot activities in this area. Accordingly, it seems to me that production methods and methods of analyzing technical problems, those which have been developed in large businesses to obtain quality products, should give rise to widespread dissemination within the industrial field.

Moreover, I want to point out that I have requested that a study be carried out concerning small and medium industries and innovation. I hope that it will provide me with new insight into the means that should be employed to overcome the obstructions which deprive small and medium industries of the beneficial outcome of national research and to sensitize them to be concerned about innovation, to help them to innovate.

Possible tax incentives:

In order to give research financed by industry the impetus that it needs, I intend to pursue, with my colleagues in economy and finance and in the budget bureau, the study of a generalized tax measure which might be similar to that which exists not only in Germany but also in Japan, the United States, and Canada.

Several solutions can be envisaged:

The basis for it could be the volume of expenditures for research, as defined by Mr Boudeville's report to the National Council on Accounting. It could also be the growth in [any] one year over the preceding one. Taking into account a magnitude of this sort would make it possible to favor business firms' outside contracts as well as their internal expenditures for research.

The basis for such reform thus could be constituted by the annual hiring of people--researchers and technicians--whose activity would come to strengthen business firms' research and development teams. Of course, this measure, which is in keeping with the spirit of our policy favoring employment, and which would cover 70 percent of the expenditures for internal research, could not be applied until 1982. This analysis is currently being conducted in anticipation of the finance law of 1982 (1983 budget).

Furthermore, I am convinced that a policy of innovation must be accompanied by an adapted financing policy. As a matter of fact, it would be daydreaming to expect business firms to devote important resources to developing new products or to making use of new technologies if they could not subsequently finance the industrialization of them. That is the reason why I am currently having in-depth discussions with Mr Delors, the minister of economy and finance, to determine ways and means that would make it possible to cause the banking network to take into account more effectively than it does at present the problems which arise in connection with the industrialization of new products.

Moreover, the entire lot of currently existing mechanisms for financing innovation must be reexamined in order to strengthen their effectiveness (long-term public credits, INODEV, financial companies for innovation, especially), just as some rethinking must be done with regard to the improvement of research, collective research, and the development of regional technological poles.

Technical centers:

Where technical centers and research centers under contract are more particularly concerned, I attach the greatest importance to their development along four main lines: the opening of upstream research in order to keep them abreast of the new accomplishments of knowledge; the opening of technical research centers through contracts; the creation of devices for associative research in new technical disciplines; the regionalization of technical centers.

Finally, as for the National Agency for the Improvement of Research (ANVAR), its financial and human means for action, especially within the regions, will be greatly increased in 1982, and I expect to make awards for innovation a powerful tool, strengthening their incentive nature by raising their rate and revising their conditions for allotment.

In the speech which he had made on 12 November at the annual banquet of the National Association for Technical Research (ANRT), Mr Chevenement had already devoted quite a bit of time to the problem of technical research centers.

"At midpoint between two worlds that are unaware of each other (the world of public and basic research and that of technological development in business firms), they nevertheless should be one of the essential instruments of communication between themselves," he had emphasized.

Some essential budget components:

Employment:

The draft budget which is being presented to you for 1982 is the first phase of a major project aimed at giving the men and women in research vigor, hope, and the feeling of belonging to the national community. To this end, five types of measures are planned:

First of all, it is a question of going back to a resolute policy of creating jobs. With this goal in mind, 1,727 positions are planned. In order to proceed with

their distribution in terms of the priorities which we shall identify, 320 positions have been temporarily entered for interministerial reserve. The other 1,407 positions allow the creation of 600 jobs for researchers and 807 ITA jobs. During the past 7 years, the annual average of these [job] creations had been limited to 700. The pace has thus more than doubled. I shall see to it that France's law on orientation and programming for research and technological development will ensure this indispensable growth up to 1985. An annual job-creation rate amounting to around 4.5 percent of the manpower on board is probably necessary.

In the second place, there is the matter of putting a stop to the dead-end situation in which the great majority of the personnel in major public research establishments find themselves. Funding has thus been planned so that the number of job conversions will be sufficient to allow satisfactory promotions and the correction of numerous injustices in career development. The rapid improvement of the ITA situation will receive priority treatment in this overall situation.

The training of young people for research and through research: Mr Chevenement referred to the decisions reached quite recently (see AFP SCIENCES No 283) having to do with the raising of allotments for research.

Revision of the statutes:

Aside from these immediate measures, it is advisable to start actively preparing for revision of the statutes on public research personnel. The statutes now in effect are, in fact, inappropriate for the new scientific and technological policy which we hope to develop. They must be completely revised in order to make it possible to attain the objectives of this new policy, and especially to ensure that research will have the quality, the dynamism, and the openness toward society that will be indispensable for its development. This requires a new statute for researchers, engineers, technicians, and administrative employees, one having a legislative basis (and not just a statutory one) so as to make it possible to ensure job guarantees, possibilities for attractive careers capable of leading to different types of activities relating to research, adequate procedures for recruitment and evaluation....

Bringing up to standard the working funds for research teams: "This is a priority task," the minister emphasized.

The draft budget for 1982 pays particular attention to this through a major increase in funding planned under the heading of program and equipment support (average-size material, and major scientific equipment) and through a first reappraisal of funding for tasks.

Thus, for the organizations whose funding is included in the budget of the Ministry of Research and Technology, the overall funding (normal costs and program authorizations) is as follows:

	1981	1982	Percent
CNRS	4,749.3	5,946.2	25.2
INSERM	834.6	1,041.7	24.8
Pasteur Institute, Paris	110.1	143.3	30.2
INRA	1,218.1	1,509.2	23.9
CEA	4,466.3	5,261.8	17.8
CNES	1,677.5	2,145.6	27.9
CNEXO	304.0	400.4	31.7
ISTPM	57.5	92.9	61.6
COMES	199.3	300.0	50.5
ADI	215.5	282.5	31.1
INRIA	113.9	156.9	37.8
ORSTOM	371.0	461.0	24.3
GERDAT	241.9	302.1	24.9

It likewise seems important to me to point out the resources made available to the research mission of the universities within the Ministry of National Education, which are going from 669.4 million francs in 1981 to 858.1 million francs in 1982--that is, an increase of 28.2 percent.

Scientific and technical information:

This, as you know, is a highly sensitive area which aims at the implementation of data bases and banks or the support of the dissemination of scientific knowledge and publishing, but which likewise embraces the whole problem of the influence of our activities in research and technological development and the defense of our language as the worldwide scientific language. It is obviously a matter of a cultural problem in the full sense of the term, and I deem it to be of the greatest importance.

Scientific and technical information, by the diversity of the public to which it addresses itself, is one of the keys to the economic, social, and cultural development of our country, but also to that of the countries linked to us through language or common interests. It is an essential factor in our national independence.

Finally, an active policy for scientific and technical information is a tool for the distribution of knowledge within the national community.

That is why we have planned an endowment of 70 million francs in 1982 under this heading, as against 50.6 million francs in 1981--i.e., an increase of 38.3 percent.

9498
CSO: 3102/104

PRESIDENT OF BELAIRBUS INTERVIEWED ON A-320 PROJECT

Paris AVIATION MAGAZINE INTERNATIONAL in French 1-14 Nov 81 p 19

[Interveiw with Michel Viseur, president of Belairbus by AMI; date and place not given]

[Text] [Question] The A-320 program could be launched toward the end of the year or in the early part of 1982. Does Belgian industry, which is already participating in the A-310 program through Belairbus, envisage cooperating in this new program? Does it, in fact, have the means to do so, and especially the financial means?

[Answer] Your question covers two areas: one having to do with industrial capacity, and the other with financial means. As far as industrial capacity is concerned (though it may be only for the mass production phase), the situation is quite clear: in Belgium, the aeronautic construction industry has enough available potential to take its place in a new program, right from the launching envisaged for the beginning of next year. Better yet: this industry not only has the desired potential; it furthermore is asserting its wish to participate in such a program, inasmuch as load plan problems will become very serious 2 or 3 years hence.

On the level of financial means, I wish to point out that to get into the A-310 program, the manufacturers who are involved in it have already authorized important investments. And the machinery bought especially for this occasion is not overworked by the A-310 load plan. So here is a very clear case of availability of means without there being any need to go ahead with investments immediately.

The fact remains--and this is true of Airbus Industry partners on the whole--that Belgium cannot rush into such an operation without some support from public powers.

[Question] But do you think it possible to obtain this financial support, because, bearing in mind the political and economic situation currently reigning in Belgium, the environment does not seem to be the most favorable?

[Answer] I shall make just one observation: all of the politicians who are involved in the problems of a fresh start for industry have incessantly reasserted the need and importance of concentrating economic revitalization efforts on new technologies and on peak sectors, which include aeronautics.

[Question] What is the estimated cost of Belgium's participation in the A-320 program?

[Answer] In financial terms, this evaluation has not been made with much precision because it does not have anything more to go on than the estimate of industrial participation. But we, like the would-be partners, are now in the study phase of this possible participation.

But, on the whole, and at the present stage of the analysis, which has yet to be confirmed, the intention in the circles concerned would be to look for an extension of Belgian participation in A-320, or in any other future program, in the same order of magnitude as that obtained for A-310 (about 2.3 percent). And this from the same vantage point, in order to derive some profit from the material investments on which action have proceeded, and to take advantage of the know-how acquired on this occasion.

[Question] In Belgium, the aeronautics industry remains among the sectors known as national. Is this situation likely to evolve, or could it, in your opinion, evolve in terms of a regionalization movement which is already being felt in other areas?

[Answer] That is purely a political matter. And on the industrial level, the important thing, I will say, is for the budgetary financial need, linked to an industrial strategy and chosen and covered by public powers, to be cleared up in a timely manner, whether this is on a national or a regional scale.

[Question] But, bearing in mind manifestations coming especially from the Flemish Aerospace Group (FLAG), a group of Flemish manufacturers (see AMI No 810, p 19), could there be a move toward an expansion of Belairbus for the benefit of new shareholders from the north of the country?

[Answer] Before taking up this issue, I first of all want to point out that the Belgian aeronautic construction industry is a small reality. To put it simply, we essentially have two builders: SABCA and SONACA (whose size is somewhere between 1,800 and 2,000 people each). That is the first characteristic of our industry. Another characteristic: the difficulty which this industry has had at all times--and this problem is going to become crucial in 1983-1984, as I stated earlier--in maintaining its load plans. And in this regard, it is clear that the industry can be kept up only by military orders or by integration into a multinational civilian program--diversification still being, in our sector, too specific.

As it is, the expansion which you have in mind is theoretically possible. This contingency was, in fact, brought up not long ago at the Council of Ministers. In reality, there would be no objection if SABCA, which at present is not participating in the Airbus program of its own accord, should like SONACA join forces as a builder in some future program of the European consortium, if it so desired, and if, by the same token, Belairbus should expand.

[Question] You stressed Belgium's willingness to participate in the A-320 program; however, the matter of its participation in the MDF-100 program has also been discussed. What exactly is the status of this?

[Answer] As I have already pointed out, Belgium actually has reasserted its willingness and determination to pursue its participation within the framework of the Airbus programs. And the concern of its manufacturers, eager to maintain their loan plans, is to be on the lookout for potential markets, either civilian or military. Then, as far as Airbus Industry is concerned, there is a project well under way, which is the A-320. Will it come out? Answer: at the beginning of next year. There are still other projects within the European consortium which likewise could come into being.

But on the political and strictly general level, there is a constant factor: it is the limitation of the budgetary means that can be allotted to programs, no matter how much determination there may be to safeguard--and even to give preferential treatment to--the aeronautics sector. This amounts to saying that at a given time, choices will have to be made. The basis for these will be the best prospects. And here again, in Belgium there is unanimity in emphasizing the importance of the Airbus programs.

Nevertheless, if we should be given no possibility of choice within the framework of the consortium, there would still be a load plan problem, anyway--a problem, moreover, that is not peculiar to Belgian industry alone. This is the reason why other projects are being studied by the manufacturers.

But as far as I am concerned, and to return to the subject of Belgium, it seems to me to be totally unrealistic to expect that this country might get out of the A-320 program and that it will not try to get into any new Airbus program.

As a matter of fact, with respect to Belgium's possible participation in MDF-100, I wish to point out that this problem has not been the subject of any study or any planning effort--not at the industry level, at any rate.

9498
CSO: 3102/64

DRIVER'S REPORT ON VOLKSWAGEN 'AUTO 2000' CARS

Paris L'ARGUS DE L'AUTOMOBILE in French 24 Dec 81 pp 1, 3

Undeniably, the VW Auto 2000 project is very broad in scope. To be convinced of that, one had but to see the four vehicles made available to French journalists during the testing day: besides one of the six complete Auto 2000 prototypes, there was a three-cylinder diesel engine with turbosupercharger under the hood of a Scirocco coupe; another three-cylinder diesel equipped with a "shock wave" Comprex supercharger in a Golf, and finally a four-cylinder gasoline engine of 1,050 cm^3 (that of the new Polo) supercharged by a Rootes type volumetric compressor in another Golf. When we learn that the "packet" allotted to VW by the Federal Research Ministry is in the neighborhood of DM 32.5 million, we can measure the abundance of the official manna, but we are forced to recognize that the investment (50 percent of the total) has been productive. To build in two years an entirely new car, master new techniques and exotic materials, create an anti-skid ABV [expansion unknown] braking system, a plastic and aluminum rear suspension, an automatic tire-pressure control, a microprocessor-regulated heating system, absolutely new seats, resin wheel rims, and a revolutionary digital driver information technique assisted by a synthetic voice--and all that in addition to three exceptional engines, is really not bad! The strangest thing is that we are still so reticent about older VW inventions--semiautomatic twin-clutch transmissions and disengageable flywheels--which are reintroduced into the VW Auto 2000.

Difficult Tests

First of all we wish to thank the press services of VW France and VW Germany, as well as the head of research, Dr Seiffert, who allowed us to test these "year 2000 cars." After the extraordinary Audi Auto 2000, which we were able to drive at high speed on the open road, VW provided us with four intelligently selected cars. There was the present engine (three-cylinder diesel with direct turboinjection) of the Auto 2000 in a Scirocco chassis: thus we had a perfect measure of what is contributed to the Auto 2000 by aerodynamics and a lightweight body and transmission. In the lighter Golfs, other possible engines for the Auto 2000, not yet frozen in their design, provided a good demonstration of the limits of the turbosupercharger solu-

tion and broadened, as the research contract provides, the field of engine experimentation--a costly one.

Unhappily, snow and glaze covered the roads of the 15-km circuit we were to drive many times; and if one adds that the beet harvest was in full swing, a road under repair, and traffic intense, then the full difficulty of the test, but also the immense confidence placed in us, can be appreciated. Thank you again.

The VW Philosophy

The Auto 2000 project began at VW in 1978. It consisted in providing a technical answer to a simple question: what will the car of the year 2000 be like?

The elements of the answer constituted a set of specifications approved in 1979 by the German Ministry of Research and Technology, which wished to further progress in several directions: fuel economy, energy economies in manufacture, and reduced pollution and noise, without renouncing passive safety, together with development of innovations capable of rapid integration into mass production--in a word, to square the circle, for it was necessary to be ready for Frankfurt 1981.

All that, however, was not enough for VW, which added other imperatives summed up by Dr Seiffert: "The car of the future must not lessen the pleasure of driving." The implication is that to sell cars--and that is their role--the customer must be tempted by other arguments than economy. It is also necessary to produce at low cost, by humanizing the work (for example, no more raised-arm work stations!). Plainly, VW has set the hurdle very high, and in all disciplines contributing to the development and sale of an automobile.

Modular Concept

In the Auto 2000 project, each manufacturer built a car in his own range: Mercedes a large one, Audi a large mid-size, and VW a mid-size, since the universities are entitled to dream a little more.

So the Wulfsburg research department began work on a large Golf of 780 kg empty weight, with a useful load of 400 kg, a length of 4.015 m, width of 1.670 m, height of 1.353 m, and an extreme width of 1.455 m forward and 1.426 m at the rear. Beyond the aesthetics of the body, to which we shall return, the point of interest is its modular conception. As with the Peugeot Vera, Fiat VSS Idea, and Audi Auto 2000, steel is no longer the sole structural constituent. The VW 2000 body is composed of three major elements, the only ones made of steel: the floor, with forward unit; the side panels; and the roof with stiffening beams.

As in the Fiat VSS, this "reticular cage" is sufficient to offer the needed resistance to torsion and flexion; the rest--front, back, and doors, is

bolted. In sequence following fitting of doors and painting, the pre-assembled plastic components are added (front, back, and hatch), then those of the underframe, with wheel slots and integrated fender wells.

The enormous advantage of this construction is that it humanizes the work as it facilitates it, and that it is an essential factor of lightness and corrosion resistance.

Aesthetics and Aerodynamics

To consume less fuel means to slip through the air. For the Auto 2000, Wulfsburg has innovated in body design: while it is usual to try to "aerodynamicize" (sic) a handsome and comfortable body, the reverse has been done here. The starting point was the wind tunnel, with analyses of "volume at quarter-scale" approximating the proportions of mid-size cars. The model which appeared best was enlarged to actual size and measured: its Cx (drag coefficient) of 0.16 was excellent. Equipped with wheels, it reached 0.18, to rise to 0.25 for the definitive operational car.

Between those two extremes, the project had made many round trips to and from the styling department and the aerodynamicists, and that is understandable. The tear-drop shape, which almost produces a "unit volume" due to the very slight break in slope between the engine hood and passenger space, does pose a few problems at the back. By a judicious dividing of the rear windows (which adds importance to the new Scirocco), the stylists have lightened the rear, and after following an Auto 2000 for several dozen km, we perforce admit that one gets used to it quickly.

While a Golf Formula E has a Cx of 0.38 and a CxS [expansion unknown] of 0.70, the 2000 falls to 0.25 and 0.47. It is remarkable, though most of the tricks are known: perfect sealing of the forward face; good handling of air circulation for engine cooling and heating; absence of gutters or protruding edges, thanks to windows mounted "outside" the doors or bonded as are the triangular rear windows; smoothness of underside, etc.

Chassis and Suspension

Designed to be built and assembled by robots, the chassis-suspension unit closely derives from that of the Golf. It was a necessity, given the wish to preserve "the pleasure of driving." Nor was there, on the other hand, any skimping in choice of materials, or in lightening.

At the front, the pivot bearing, with strut anchoring sleeve, is of light alloy: there is a saving in non-suspended weight and a reduction in the number of parts, which was imperative for recovering the higher cost of the light metal. Though the weight saving is 70 percent, the possibility remains of installing, very rapidly, production parts having much greater resistance.

At the rear, they were not heavy-handed either! The "flexible" axle with wheels taken from the Golf is this time made of plastic (two shells) reinforced by a sheet of bonded aluminum. Though the volume of the component is much greater, the weight is reduced by 50 percent, and resistance to corrosion is unlimited.

The rims have been given the same slenderizing treatment: made of a composite plastic, they are lighter by 40 percent. For our test, they were replaced by strong alloy rims, for safety reasons. A Citroen SM having won the Moroccan rally with such plastic rims by Michelin, we wager VW will soon attain sufficient reliability and low cost.

Engines

A body can be lightened to the utmost, but an engine is still needed to give life to the car! VW has worked in two major directions:

Super-economy, with a three-cylinder supercharged diesel of 33 kW (45 hp)

Comfort and more lively performance, with a four-cylinder supercharged gasoline engine of 55 kW (75 hp).

The principle of supercharging has proven itself: with a small engine, hence with light weight and minimal friction, remarkable power is obtained. For the diesel, therefore, VW has drawn from its stock, taking a 1600 cm^3 four-cylinder engine and literally "sawing" a cylinder. Entirely of light metal, unlined and treated with Nikasil, the three-cylinder unit was given a direct-injection head (a gain of 10 to 15 percent), but no balancing shaft. This compensating shaft technique, very current in Japan, was tried on a test bench (with an external shaft), but severe vibration stress at engine mounts, even at the smoothest operating speeds, led to its rejection. Bravo! For though the noise of direct injection (greater than that of engines with precombustion chambers) is audible at idle, it is much less so at speed, with vibration staying at an acceptable level comparable to that of good diesels 10 years ago.

The gasoline engine is the 1050 cm^3 power plant of the new Polo, with supercharger added. It thus develops 75 hp, or the power of a 1500 cm^3 of conventional type without supercharger (with 50 hp/l, or the European average).

Superchargers

For speed, VW has put a turbosupercharger on the three-cylinder diesel. Garrett and KKK [expansion unknown] ~~have~~ broad enough lines so that the right turbo is immediately available, but the Wulfsburg technicians are visibly excited by the Comprex. At a 20 to 1 compression ratio the turbo engine develops 45 hp at 4,000 rpm, a torque of 98 Nm at 2,500 rpm, and has a good specific consumption between 218 and 230 kWh between 1,700 and 3,000 rpm.

Initial tests with the Comprex shock wave supercharger, though still with a precombustion chambered head, gave excellent results: 59 hp at 3,600 rpm and 130 Nm at 2,000 rpm. Still better results are expected when direct injection is installed.

For the gasoline engine, the good old volumetric supercharger of our fathers' time was reverted to: of Roots type, it was designed by VW (as was also its feed system) and built by Aerzner. The novelty is that it is driven by a V-belt and a pulley with variable circumference, thus giving infinite ratios in relation to cransshaft speed, allowing a constant boost pressure over practically the entire range of engine speeds.

At the Wheel of the Auto 2000

Before trying out the Auto 2000, we drove the Scirocco with three-cylinder turbo-diesel engine. It was very disappointing. The 45 hp had trouble moving the coupe, though it had a good Cx. It was impossible to catch up to the Auto 2000 ahead of us, which made us all the more avid to try it.

As to comfort and passenger space, nothing was slighted in the Auto 2000: the plastic seats, with foam upholstery of several grades, are excellent; the new digital instrument panel is readable, even though handling of the controls is still unfamiliar to us; and the heating system, its air mixture controlled by microprocessor, is remarkably efficient.

The usual explanations completed, there is no need to turn on ignition: simply go into first (without disengaging, for there is no clutch pedal!), and accelerate. During short stops, both car and engine are stopped, but the flywheel continues to idle, the two systems linking it to the engine and gear box being disengaged. On engaging first and accelerating, an electronically controlled pneumatic assist engages the first mechanism and actuates the injection pump; the engine, again impelled by the flywheel, starts almost instantly; the second mechanism engages, and the car moves off.

Since the wheels were resting on a thick layer of glaze, we did not dare accelerate fully, and we stalled! The second time, we started off correctly, but it was a "jackrabbit" start. From then on, shifting up through the speeds is done conventionally.

Start-Stop and Cutoff

On the highway, in fifth gear and at good speed, the engine stops instantly as one lifts one's foot, the Auto 2000 continuing on its momentum. It is impressive, especially when this happens on a slippery downgrade, and one would like to have a few horses underfoot. At stoplights, the engine likewise stops, then starts up again with pressure on the accelerator, first speed engaged. This resembles the start-stop of the Formula E, which is currently sold, except that engine stop is automatic rather than pushbutton controlled.

Though we are accustomed to that semi-automatic gear box, and to the stop-start, we have not yet assimilated the cutoff on release of accelerator pressure, which is certainly very economical of fuel, but which deprives one of all motor function, at times in critical situations, and makes for anguish while waiting for the engine to cut in again. Be that as it may, such intermittent operation brings actual fuel consumption close to that for normalized speeds: 4.2 l in town, 3.3 l at 90 kph, and 4.9 l of gas-oil at 120 kph. Where are we headed if very low fuel consumption figures are obtained, and then proven on the highway?

By fingering the minicomputer which serves as an instrument panel, one can elicit a great variety of data which in theory help to achieve better driving. But can one really drive badly in this Auto 2000, so light and well profiled that the asthmatic Scirocco engine is here much more spirited!

Comprex and Volumetric Supercharger

No need to mince words--the Comprex is the foot on the gas. The three-cylinder engine has its noise "chopped" by the Comprex, which adds a slight whistling, as if one were hearing the purring of six cylinders! At the slightest demand, the car surges, giving proof of an excellent torque, and behaves most pleasantly.

The sound pickup inspires confidence, the Golf roars with ease; we understand the technicians' preference, for it is also our own, and we rejoice in anticipation, knowing that the Auto 2000 will be equipped with the three-cylinder Comprex.

The same vivacity delights the driver of the four-cylinder gasoline version. Engine sound is pleasant, and pickup, thanks to the volumetric supercharger, is instantaneous, straightforward, and powerful. A test installation enabled us to experience the whole contribution made by the variable-feed supercharger: it operated only in response to urgent power demand and strong accelerator pressure, but at constant speed it could be forgotten. That small marvel seemed to us to have little tinkering about it, and to be close to the production stage, and we catch ourselves dreaming and hoping that it will indeed soon be in production, with its marvelous anti-ping ignition, which is a great VW innovation in this field. Also noteworthy is the fact that heat problems in this engine are so well mastered that jackets are cooled by water on only half of their surface!

At all events, there is not the slightest doubt: the Auto 2000, which was to reach 150 kph, 0 to 100 kph in 20 seconds in the diesel version; and 180 kph, 0 to 100 kph in 12 seconds in the gasoline version, will do so with ease, and the Comprex version surely better.

Conclusion

To evoke all the other technical particulars of the engines, the very considerable passive safety, the ABV antiskid braking, the artful aspects of

the passenger space, the thin Makrolon windows, and the technology of the hood and hatch--all that would lead us far, as rich as these cars are, for that is their vocation, in new technologies.

The important thing is to take note that in two years the "cars of the year 2000" have been built. If they are not perfect, they show the path to be followed. A great many innovations are easily and immediately applicable, and within 3 to 5 years they will be in production, with all the economies they will bring about. Others, which necessitate considerable modifications of industrial structures (the "quid" of plastics and fibers?), will come in their time, as determined by events and oue energy future; but is not the main point, when facing a new problem, to bring to it a solution already known and proven?

In all domains, VW is ready.

Bayer's Valuable Assistance

Bayer, the renowned chemical firm of Leverkusen, broadly collaborated in various Auto 2000 projects. It put its incomparable knowledge of plastics at the service of VW, Daimler-Benz, and Unicar engineers, Unicar being the fruit of cooperation by German universities. Notably absent was Audi, which preferred to develop the sector of "sandwich" materials.

At VW, various subassemblies were made from a base of Bayer technopolymers. Also perfected was an all-plastic seat, of which the adjustable shell is of polyamide strengthened with glass fibers, and the upholstery of polyurethane which hardens with cold. Polycarbonate with a scratch-proofing treatment was used for the fixed side windows. Forward and rear body panels are constituted by a support of polyester resin strengthened by glass fibers, and an elastic coating of polyurethane foam with integrated Bayflex skin. The car is painted entirely with a supple polyurethane paint especially perfected to compensate for the different expansions of steel, aluminum, and plastics.

Technically, it is noted that the Bayflex used for the front of the VW 2000 remains flexible between -20 and +65 degrees C. Bayer states that its resistance to corrosion and aging assures long life for those components, but this is contested by many engineers who think it is still too soon to judge.

These methods offer great freedom in design: the front of the VW is a single piece, cast by the RIM (Reaction, Injection, Moulding) process, and replaces numerous metal parts.

The mechanical properties of the unit are remarkable, thanks to an integral front of polyester resin (Leguval), strengthened by glass fibers varying in quantity with stress load, of modulated thickness from 2 to 6 mm. This multifunctional unit, easily assembled in production with six bolts, can be mass produced from SMC (Sheet Moulding Compound) with a Leguval base.

This SMC technique, used by Fiat-VSS and Peugeot-Vera, is also debated. Audi rejects it, and the Americans are now abandoning it, at least in the thick coating process.

6145
CSO: 3102/120

ALL-COMPOSITE WING UNDER DEVELOPMENT IN SWEDEN

Wing Described

Stockholm NY TEKNIK in Swedish 14 Jan 82 pp 8-9

[Article by Karl G. Jonsson: "The Wing Made Entirely of Plastic--Soon It Will Fly in Sweden"]

> [Text] Malmo. A high-lift wing made entirely of plastic. The former head of Malmo Flygindustri, Rudolf Abelin, is producing one. It is the first time that such a large composite [laminated] wing section has been built in Sweden. During this year a plastic wing will be flying.

The wing is part of a STU [National Board for Technical Development] project, with a certain connection to Saab-Scania's MULAS project, which was presented a couple of years ago. But Rudolf Abelin says that this wing is purely a research project. What is needed is simply to verify wind tunnel data with flights and tests on the wing profile, and to learn how an all-composite wing stands up in its real environment.

The first large wing section which would fit on a MULAS is already at the FFA [National Aeronautical Research Institute] in Stockholm for rigidity tests. Now the construction of a smaller wing has begun, which will be test flown on a Saab MFI 15 Safari. One wing will be load tested at FFA.

Curved Surfaces

The wing girders are built of carbon fiber laminate with fiberglass laminate on the curved surfaces.

[Portion omitted here] new in connection with flying," said Rudolf Abelin. "But previously it has mostly been with smaller parts in combination with metals. We believe that our first wing section is the largest individual section built entirely of composite material."

This first wing section is the load-bearing midsection without wingtips, and is comparable in size to a DC-3 wing. The entire wingspan with wingtips would be about 17 meters.

Begin at the Other End

To build with laminated materials is to build strongly and lightly, but hardly cheaply. This is a fact which they will try to change at Malmo.

"The laminate technology is and has been an extremely advanced technology. Laminates are used where traditional materials are no longer adequate.

"We are trying to begin at the other end. We are using laminates in order to build simply and cheaply. Not to fly with double the speed of sound. And we use carbon fibers only where we need them!"

The big mistake usually made when working with laminates, according to Rudolf Abelin, is that they work with it as though it were sheet metal. They do not utilize the advantages of the material.

90 Percent Disappears

"The technique of composites is very similar to construction with wood, where one is also dealing with fibers. Except that instead of reducing down, we are building up."

Rudolf Abelin, who is not the only one on this project who has had experience in the wooden aircraft era, estimates that they only work off one to two percent of the laminate material. When machining metal parts it is not unusual when 90 percent of the material disappears.

"Therefore we can say that our material is more expensive before, but cheaper after processing."

Furthermore the tool costs are considerably lower--perhaps one-tenth of the cost of building with sheet metal.

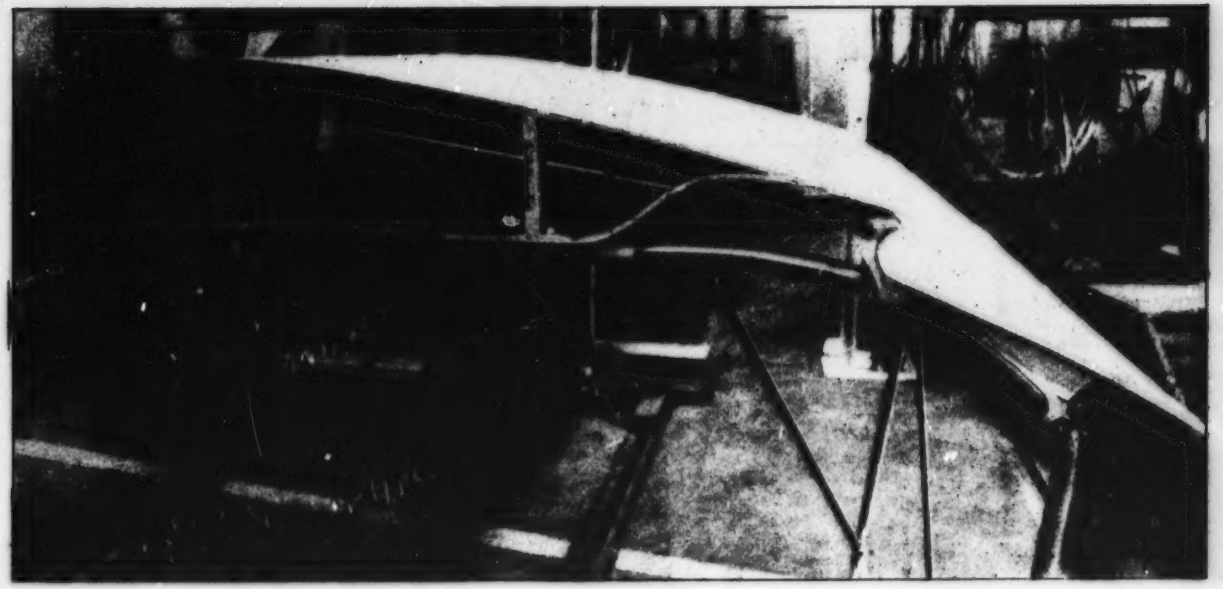
Higher Precision

Among other things, the research program at Malmo is trying to find better combinations of reinforcements and plastics. They have also developed a simpler and cheaper way of production by extending wing sections. For the same price they get greater precision. Wing panels and girders are built up one at a time and glued together into a strong unit. The wing profile, designed by Sven-Olof Ridder, gives almost double the lift of a conventional wing of the same size.

This is not only because of the different profile, but also because one-third of the weight can be saved, thereby enabling increased wingspan.

The wing is very blunt and has a flat underside. A built-in flap increases the wing surface by 20 percent when in the extended position.

The profile in itself is not unique--on the other hand it is the first time that wing and flap are constructed as an integral system. Normally the wing is designed and tested by itself. Thereafter a suitable flap is constructed.



Caption: Section of the wing which will fly on a Saab MFI Safari later this year. In the background is the large laminated wing section.

The wing will function in the lower speed range--up to 400-450 km per hour.

The first large all-composite plane--America's Learfan--is already flying.

"But we could have been several years ahead of them," said Rudolf Abelin, "if Malmo Flygindustri had not been shut down."

MULAS Project

Stockholm NY TEKNIK in Swedish 14 Jan 82 p 9

[Article by Sven-Olof Carlsson: "What Was MULAS?"]

[Text] MULAS (Multi Utility Light Aircraft System)--the project was a big idea for a transport system for large areas without roads, primarily in underdeveloped countries. In the system there was to be a "flying truck"--MULAS--for heavy transport, and a little light aircraft for such things as dropping food in flight, modeled after Gustaf von Rosen's food bombings in Ethiopia. There was also a plan for agriculture and forestry, and special adaptations of aircraft for a number of different transport tasks.

Saab-Scania's concept for such an aircraft--called Transporter--and Saab collaborator Rudolf Abelin's MULAS were then closely related.

But Saab's Transporter became the Saab-Fairchild SF 340, an advanced but more traditionally built feeder aircraft, primarily for passenger transport between the fine permanent airports of the western world.

Saab removed its support from the project for the aircraft intended for simple airports in inaccessible places. And the MULAS project lost its momentum.

But some development projects with their origins in the MULAS concept still live, and are waiting for new initiatives.

The most timely of these is wing and rudder construction of fiberglass and carbon fiber laminates.

Some of the others participating in these development projects with Rudolf Abelin are STU, FFA and Matasi Plast in Malmo.

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CSO: 3102/141

END

JPRS 80266

8 March 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 95

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JPRS 80266

8 March 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

No. 95

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ELECTRONICS

FIRST FRENCH MACHINE FOR ETCHING INTEGRATED CIRCUITS

Paris ELECTRONIQUE INDUSTRIELLE in French 15 Jan 82 p 23

[Article by PI]

[Text] Designed and built by the Vacuum and Mechanics Division of CIT-Alcatel, with the support of the Ministry of PTT (Mail, Telephone, and Telegraph), and with the collaboration of LETI (Electronics and Data Processing Technology Laboratory) (AEC), the GIR 2000 is the first European machine for etching very high density (VLSI and VHSI) integrated circuits.

The original feature of the GIR 2000 is that it can handle two slices of silicon, one by one, in two reactors located one behind the other in the path of the slices; two etching processes can be used in the same enclosure: a purely chemical one for reactive plasma etching (GPR), and a physicochemical one for reactive ion etching (GIR). The etching operation can thus be performed in two stages, like conventional mechanical machining: rapid and anisotropic machining (perpendicular to the etched surface), followed by fine and selective finishing (immediate cessation of the substrate attack at the end of the etch).

These two operations can be performed by using either one of the etching modes, GPR or GIR. The GIR mode produces a physicochemical etch quite perpendicular to the etched surface, a necessary condition for submicron etching. The GPR mode produces a finishing etch (very selective chemically and without risk of damage to the substrate). Each of these operations can be carried out in an independent reactor, using different etching gases if necessary.

The etching operation is controlled by a laser system which determines the thickness of the layer to be etched after introduction into the first reactor, and then measures the etching rate during the plasma attack, this latter value characterizing the quality of the etched layer and thus the performance of the circuit. And lastly, the laser determines the overetching time (deliberate extension of the etching process so as to perfect the finishing). The non-uniformity of the slice is less than 3 percent. The laser could prove to have a double use: research is currently being carried out to use laser interferometry to control the quality of etched circuits.

The machine is loaded and unloaded by means of a cassette slice-distributor for 20 slices of 3-5 inches. The machine is fully automatic, controlled by a 6809 microprocessor (EFCIS), with incorporated parameter storage and display. Production rates are between 30 and 60 slices per hour, depending on etching conditions.

CIT-Alcatel has current sales of 14 MF in thin-film machines (vacuum deposition or sputtering and etching); this figure should grow to 22 or 25 MF in 1982, and reach 60 to 70 MF toward 1985, essentially thanks to etching. In order to achieve this growth, the division will move into a new specialized plant of 2500 square meters at Annency, devoted to thin film machines. This plant will be capable of producing 10-15 machines per month begining in 1983. And finally, the company is now working on a batch machine with automatic loading, capable of treating 150 slices per hour; this machine should be available in 1983.

Strategic Interest

Presently entirely dominated by the United States and Japan, the market for dry etching equipment is of obvious strategic and economic interest. It is indeed estimated that the world market, which was 90 million dollars in 1980, should grow to 335 million in 1984, with the growth rate for Europe and the West alone being predicted to be about 57 percent per year in value.

PHOTO CAPTION

1. p 23. Developed by CIT-Alcatel, the GIR 2000 can handle 30-60 slices per hour, depending on conditions. Its operation is entirely automatic, controlled by a 6908 microprocessor, with integrated parameter storage and display.

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CSO: 3102/143

ELECTRONICS

THOMSON-EFCIS: CURRENT, FUTURE PRODUCTION OF PROM'S

Paris ELECTRONIQUE ACTUALITES in French 15 Jan 82 p 15

[Article by J. P. Della Musia: "Samples of the First Thomson-EFCIS 16K PROM"]

[Text] The first samples of a Thomson-EFCIS 16K PROM having been well received by a few selected users, the Integrated Circuit Division (DCI) of Thomson-CSF is now in a position to move to large scale sampling (under the Thomson-EFCIS brand) for all interested users. This model, referenced as SFC 71 190/1, is a 2KX8 PROM, second source for the standard model introduced by Signetics. It uses an advanced TTL-LS technology of the emitter-follower type, and offers an access time of 35 ns. The chip area is 25 mm-square; the finest lines on the fusible-links do not exceed 1.5 microns, which represents a low performance for a mass product.

An Offensive for Digital Bipolars

This digital bipolar circuit is a "vehicle" logic circuit, representative of the 1980 state of the art, which allows Thomson-EFCIS to gain a new foothold in high performance digital bipolar technology. Bipolar technology with fusible-links was already used five years ago by Sescosem, which had an off-the-shelf 4K model with nichrome technology. But the company was undergoing serious losses at that time, and production had to be curtailed. Development efforts were therefore concentrated on analog circuits. At the beginning of 1980 however, delivery lead times for PROM's on the world market exceeded one year. The financial situation of the division having improved, the decision was reached to reinvest in this domain by producing a 16K model with an almost conventional technology, at least at first (compared to Sescosem's old PROM's, the fusible-links, which are only 1.5 microns wide, are of titanium-tungsten rather than nichrome, the epitaxy is thinner at less than 3 microns, the emitters are diffused through the polycrystalline material, and the process involves ion implantation). Since the market will remain strong for a long time (the speed of these memories is needed in many applications), commercial risks are low, manufacturers are few in numbers, and the world market amounts to 400 million dollars. This offensive had the advantage not only of involving the division in an interesting area, but also introducing processes for rapid digital bipolar technologies, which could be used as springboards for the production of other bipolar circuits that are in great demand, such as microprocessors, multipliers, converters, and eventually TTL's programmable by fusible-links. Since

then, and as part of the integrated circuit plan, prototypes of 4K PROM memories with lateral oxide insulation, have been built in order to perfect an Isoplanar type process (no decision has been reached about the eventual commercialization of this memory). It can be expected that this technology will be used for the company's future advanced circuits, if only because the rules for reducing circuit dimensions apply readily to Isoplanar type circuits (a library of precharacterized circuits in this technology should already have been installed).

Two Other Version in Preparation

The 16K PROM being sold today and which should enter into mass production within two months, will soon be followed (before June) by a smaller geometry version, with an area of 18 mm-square and an access time of 30 ns. The next version, which should be market sampled at the end of 1982, will be smaller yet: only 14.5 mm-square, and perhaps even less. An access time of 25 ns is being aimed at. It is possible for this version to be the first at DCI to commercially use an Isoplanar technology which it calls EPILOX 1. The 32K and 64K versions to follow, will make use of the same technology.

But the second technologic generation of lateral oxide insulation, EPILOX II, is being developed at the St-Egreve plant. This is a generation equivalent to Isoplanar II, but with thicker epitaxy (1.2 microns) and with two self-alignment sequences, partly in order to obtain better fabrication yields. Polycrystalline technologies are also being involved in order to reduce consumption and chip areas. This technology, which will allow transition frequencies of 6 GHz, similar to those of transistors, should be used industrially in 1985. Other improvements will then be possible by using two levels of polycrystalline silicon and an non-saturated internal logic. Thus, starting with an advanced TTL with a figure of merit of 3 ns/8 pJ, self-alignment makes it possible to reach 1.5 ns/4 pJ, and the use of one level of polycrystalline silicon 1.5 ns/0.8 pJ. With two polycrystalline levels and a non-saturated logic, it will be finally possible to achieve 0.3 ns/0.18 pJ. But this is still far from industrial production.

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CSO: 3102/143

FRENCH COMPANIES ATTAIN OBJECTIVES OF VLSI PLAN

Paris ELECTRONIQUE ACTUALITES in French 22 Jan 82 p 12

[Article by JPDM: "EFCIS and DCI Achieve Their VLSI Plan Objectives"]

[Text] The French integrated circuit plan, which will end in 1982, included a research and development section called the VLSI plan, which ended in 1981.

And while as part of the VLSI plan, Eurotechnique and MHS obtained large loans and subventions to acquire technologies and invest in equipment, EFCIS and the Integrated Circuits Division (DCI) of Thomson-CSF have had the benefit of study contracts to develop technologic processes and products in order to achieve technical independence. A large portion of these actions is therefore part of the VLSI plan.

Within this plan, EFCIS and DCI have achieved most of their stated objectives. At the end of 1981, the first results have been EFCIS's attempts to distribute the 68000 microprocessor with a proprietary H-MOS 2 technology with 2 micron lines, and DCI's market sampling of its first 16K PROM's.

We might recall that as part of the integrated circuit plan, EFCIS received an aid of 190 MF, tax-free, for process studies and development, and DCI 100 MF, also tax-free; the contracts signed by them implied that equivalent investments had been made by the respective industrial enterprises.

Between 1978 and 1981, EFCIS will have invested along with these sums 250 MF of its own funds, and DCI 150 MF, solely for industrialization.

The Means for Independence

As part of the integrated circuits plan, EFCIS and DCI (Thomson-EFCIS brand) have especially sought to achieve independence, either the level of technologies, circuits, or commercialization (outside of the plan).

In 1978, EFCIS's processes were not sufficiently strong to attack the world market. That is why the company, in order to develop sales, bought with its own funds the N-MOS and H-MOS 1 (3 micron) processes from Motorola, in collaboration with LETI, LCR, and CAMECA, so as to become technologically independent for advanced circuits 2 micron lines (H-MOS2) and more (H-MOS 3 to 5).

These studies, now ended for H-MOS 2, have already affected H-MOS 1 circuits, whose yields have been improved through plasma etching, as well as C-MOS devices, which currently involve more than half of EFCIS's circuit production. They will also make it possible to envisage the production of advanced circuits by combining H-MOS and C-MOS technologies on the same chip.

If EFCIS/DCI entered into the advanced technology race, it was not in order to become a technologic leader and produce circuits more complex than those on the market, but simply in order to improve the production yield of existing or future circuits, and in order to increase the speed of these circuits in general. In short, it was a matter of providing all the material chances for circuits which must become increasingly innovative in their integration.

As part of the agreement signed with the government, 50 percent of the credit allocated to EFCIS, and 20 percent of that allocated to DCI, was assigned to the VLSI effort. The remainder was and is devoted to the development of production lines (processes) as well as product lines.

Progress Still Necessary on Materials

In the EFCIS VLSI program, all the objectives have been practically attained, with slower progress having been noted on the material silicon.

As part of its materials research, EFCIS has studied the influence of oxygen and carbon in bulk silicon, and has compared the substrates of various suppliers in this respect. It proved difficult to obtain the materials specified. The company has also investigated the deformation of 3 and 4-inch substrates, and demonstrated the important role that could be played by treatment temperature reductions in this respect. And finally, EFCIS has used test circuits to study epitaxial deposits on substrates.

All the objectives in masking research have been reached. In particular, the aim was to use wafer stepping for the H-MOS 2 and HC-MOS technology; EFCIS is now effectively capable of reproducing 2 micron plus/minus 0.2 micron lines on 4-inch slices with production equipment.

Several objectives were defined for etching. Apply plasma etching to H-MOS 2 technology: that is now an accomplished fact. Etch silicides: that has been accomplished (but the anisotropy is still insufficient). And finally, improve dimension control at critical stages: better anisotropy has been obtained thanks to reactive ionic etching.

In the CAD and modelling field, all objectives have been met. Models, as well as analog models, have been perfected for circuits up to H-MOS 3. Multi-level (graphic, symbolic, electric, and technologic) data bases have been established. And finally, parametrable macrocomponents have been defined.

H-MOS 2 Beginning Production in Mid-1982

These VLSI studies have already had an industrial fallout. Plasma etching on silicon nitride and polycrystalline silicon is used in the fabrication of H-MOS 1 (which have been in production since the beginning of 1981) and of C-MOS circuits.

Wafer stepping (10/1), plasma etching, and the use of silicides, will be exploited industrially on H-MOS 2 circuits beginning in mid-1982 for market sampling (mass production in 1983). Feasibility for H-MOS 3 (1.2 micron patterns) has now been demonstrated, thanks to optical solutions for lithography and to reactive ion etching.

A 16K PROM Sampled

Thomson-EFCIS does not yet want to disclose all the important results obtained in the bipolar field. However, it is as part of the VLSI plan that it was possible to develop 1.5 micron fusible-links and a process named EPILOX 1 (lateral oxide insulation on epitaxial layer) for digital circuits, which make it possible to build an experimental 4K PROM, and then in part, a 16K PROM which is being market sampled today. A process called EPILXOX 2 is being tested, with the aim of providing Thomson-EFCIS with a technology for lateral oxide insulation (improved Isoplanar type) for 2 micron lines and thin epitaxy.

EFCIS Service in Tokyo

As we have said, EFCIS and DCI have sought since 1978 to become independent, not only technologically, but also for circuits and commercial services. That is why, relying on the Thomson-CSF export network, Thomson-EFCIS has entered the international market to sell standard products, as well as to discover tomorrow's leading products. Thomson-EFCIS thus has marketing representatives in Germany, Italy, the Far-East, and soon in the United States. In the Far-East, Thomson-EFCIS is located in Singapore, where one million circuits are assembled each month, and in Hong Kong, where it has a testing group, marketing and commercial services, and an assembly activity for certain products. EFCIS has also hired its first employees in Tokyo four months ago.

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CSO: 3102/145

ENERGY

FRENCH PROJECTS FOR UNDERGROUND GASIFICATION OF COAL

Paris SEMAINE DE L'ENERGIE in French 12 Jan 82 pp 15-16

[Text] Within its program of research and development of coal utilization technologies, Charbonnages de France is pursuing experiments in deep underground gasification techniques.

The French underground gasification project aims at gasification of deep coals inaccessible for development by traditional mining methods. According to an initial estimate, coal reserves thus recoverable could be evaluated at 2 billion tons. Only understanding of all technical criteria of the process, however, can permit their precise determination.

Techniques to be applied relate to widely diversified fields, so Charbonnages de France, Gaz de France, IFP [French Petroleum Institute], and BRGM [expansion unknown] have joined their expertise to form the GEGS [Underground Gasification Study Group]. Its aim is to bring into use, in time, an industrial process for production of a synthetic natural gas by surface conversion of primary gas obtained by underground gasification of coal into methane. The process consists of successive steps:

Drilling of two bore holes a few dozen meters apart;
Creating a passage between the two bore holes;
Achieving enlargement and permanence of the passage by retrocombustion (progression of combustion in a direction opposite that of the air current);
Attaining complete combustion of the vein by injection of a gasifying agent into one of the bore holes;
Recovery of gases thus produced in the other bore hole.

Concurrently with laboratory studies conducted at the CERCHAR [Coal Mining Study and Research Center], field experiments were performed at Bruay-en-Artois (Pas de Calais), and are in progress at L'Echaux (Loire) and La Haute Deule (Pas de Calais).

The Bruay-en-Artois Experiment

The aim of the first in situ experiments conducted in 1979 and 1980 at site

no 6, Bruay-en-Artois (Nord Basin and Pas-de-Calais Collieries) consisted of opening a passage between two bore holes. From a mine gallery 1,000 m deep, two bore holes 65 m apart were drilled to reach a coal vein 1.20 m thick located 170 m deeper. The method chosen consisted of two stages:

Pre-connection by hydraulic fracturation to provide minimal connection between bore holes;
Enlargement of, and attainment of permanence in the connection by retrocombustion.

Successful pre-connection by fracturation, which is a world first, led GEGS to start, in July 1980, the first experiment in lighting and retrocombustion at great depth.

That experiment gave encouraging results and provided much data, particularly concerning problems of oxygen absorption by coal and of self-lighting, which will be taken into account in the new experiment to be started at the Haute Deule site.

The Echaux Experiment

Another series of experiments is in progress at L'Echaux in the Loire Collieries, in a coal vein of shallow depth (30 m). On this site are performed tests of connection by electrocarbonization and of chemical lighting, and attempts are made to improve coal permeability by chemical attack.

The Haute-Deule Experiment

In the next few days a comprehensive experiment on the principle of underground gasification will begin at the Haute-Deule site near Pont-a-Vendin in Pas-de-Calais.

Two zones will serve as the experimental site on both sides of the Haute-Deule canal. In each will be drilled an initial bore hole for the necessary reconnaissance. Then, in one of them, the Bruay-en-Artois experiment will be repeated, but this time from the surface, to reach a vein 1,000 to 1,200 m deep consisting of a different type of coal. In the other zone will be established the demonstration pilot which will permit the experiment to be carried to the point of coal combustion, with recovery of gases for interpretation and analysis.

6145
CSO: 3102/134

ENERGY

COAL GASIFICATION ON THRESHOLD OF BEING ECONOMICAL

Duesseldorf EUROPA CHEMIE in German No 35/36, 1981 p 637

[Article subtitle: "Uhde's Symposium on Coal Refining: Demonstration Plant at Wesseling"]

[Text] Coal gasification has not in general achieved the leap necessary to become an economical process; however, there definitely are examples where this threshold is being reached, if not surpassed. This was said to Dutch experts by Dr Hermann Weber, managing director of Uhde GmbH, Dortmund. Such examples would be the plants of Sasol Ltd in the Republic of South Africa, for which security of supply as well as economy was the reason for initiating construction, and the project of Rheinische Braunkohlenwerke AG [Rhine Brown Coal Works, Inc].

Today Uhde offers a number of processes which in part were developed with other partners. At Uhde, Texaco coal gasification is judged to be a good possibility. This process has both cost and environmental advantages because, at the elevated gasification temperature in entrained flow, byproducts are not formed which would require expensive technical equipment for wastewater treatment. The high-temperature Winkler process is intended for gasification of brown coal. A pilot plant operated since 1978 (30 metric tons per day) confirms it to be economical. Rheinbraun therefore plans to construct a large-scale plant for production of synthesis gas which will be able to supply a 1000 metric ton per day methanol plant. During the approval process, already completed, it was possible to prove that the authorities' requirements with respect to environmental protection was met fully. The request to do the detailed engineering was recently given to Uhde. The first train of the plant is supposed to go into operation in 1984.

Until now methanol has been produced mainly from natural gas. A changeover to coal as a raw material means that, apart from coal gasification, supplementary treatment steps and additional plants are required. Moreover, there are increased expenses for environmental protection. Investment costs for a methanol plant from coal are therefore more than twice as high as for a natural gas plant. This means that the capital cost component of the production cost becomes larger. Where coal is available at low cost, the production will be competitive.

Further subjects of the symposium were coal gasification for combined-cycle power stations and the Mobil process for conversion of methanol to gasoline. High-octane

gasoline can be produced from methanol by dehydration over a zeolite catalyst. By application of fluidized bed technology, a very simple processing at high yield can be obtained. Inasmuch as the laboratory and small pilot plant tests have been successfully completed, a demonstration plant with a capacity of 20 metric tons per day is now being constructed at Wesseling near Cologne by the partners Mobil Research & Development Corporation, Union Rheinische Braunkohle Kraftstoff AG [Union Rhine Brown Coal Fuel, Inc] and Uhde. The plant will go into operation in 1983.

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CSO: 3102/137

ENERGY

'CIRCULATING FLUIDIZED-BED' COMBUSTION LOWERS ALUMINUM COST

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 18 Dec 81 p 7

[Article: "Coal Utilization without Polluting the Environment; A New Energy Concept from Lurgi"]

[Text] L.P. Frankfurt, 17 December--A new process to replace oil and gas with environmentally benign combustion of even low-quality domestic coal and thus to reduce the energy cost of aluminum production considerably has been proposed by the Vereinigte Aluminum Werft AG [United Aluminum Shipyard, Inc] (VAW). Coal combustion is carried out by means of a "circulating fluidized-bed" process developed by Lurgi Chemie and Huettentechnik [Lurgi Chemistry & Iron and Steel Technology], Frankfurt, and VAW. A demonstration plant with a thermal capacity of 75 megawatts is under construction at VAW. After it is put into operation in mid-1982, it will be the largest plant of its kind. The project is supported with government money. The characteristics of the new process are:

--Fuels of various qualities can be used, including high-ash and high-sulfur coals.
--A very high degree of coal combustion is achieved, and thus the fuels are almost completely utilized.
--Environmental pollution is kept very low. High degrees of desulfurization of over 80 percent have already been achieved through the addition of relatively small amounts of limestone. Emission of highly poisonous nitrogen oxide in the flue gas is avoided to a very large extent by the low combustion temperatures and by a two-step combustion process characteristic of the circulating fluidized bed.
--The firing system has good partial- and low-load operating characteristics, and single units of up to 300 megawatts electric are achievable in the future.

Large-Scale Technical Experience

The new process does not rely primarily on development on the laboratory or small pilot plant scale. Fluidized bed technology has been applied on an industrial scale by Lurgi for almost 30 years for the various processes of the chemical industry, with great success. This includes more than 200 plants with so-called stationary fluid beds for the roasting of sulfide ores at 800 to 1000° Celsius, followed by sulfuric acid production in which, as required by the process, waste heat boilers for cooling the gases by generation of steam are needed. The so-called "circulating fluidized bed," which also is a joint Lurgi-VAW development, is today the standard process for drying (calcination) of wet aluminum hydroxide at

temperatures of over 1000° Celsius, in the course of aluminum production. Twenty-four plants under construction or in operation since 1970 represent about 40 percent of the world capacity of aluminum oxide production today. The success of the process is considerable because of the fact that up to 30 percent energy in the form of oil or gas can be saved in comparison with processes used up to now. A new process has been developed on the basis of proven components by specific research and development which is now to be demonstrated on an industrial scale at Luenen.

Energy Costs Considerably Reduced

Technically the new process consists essentially of coal preparation, the fluidized-bed combustion unit, a boiler for the production of steam from flue gases at 850° Celsius and a heat exchanger for heating the molten salt. The molten salt serves as the high-temperature heat carrier in a processing step of aluminum oxide production. Up to now, the molten salt had to be heated in oil- or gas-fired separate combustion chambers. Grate-fired installations in which only high-quality and thus expensive nut coal could be fired were used up to now for the steam generation of the factory.

The new firing installation substitutes a low-quality fuel, in this case ballast coal with up to 60 percent ash, for oil and gas as well as high-quality coal. Energy costs of the factory can be reduced considerably by operation of the new plant, and the energy supply can be assured long-term from domestic sources. Despite these successes, the fuels oil and gas cannot be replaced in all production steps. In particular, the highly energy-intensive step of calcination of the aluminum hydroxide in the circulating fluidized bed requires oil or gas as a clean fuel because contamination would lead to unacceptable contamination of the product. Direct substitution through the combustion of coal is therefore not possible. Here, the next processing step has already been proposed; it leads to complete substitution for oil or gas and thus the supply of the industrial enterprise with a complete range of all forms of energy--gas, electric current, steam, high-temperature heat (molten salt)--on the basis of a single raw material, i.e., low-quality domestic coal.

Partial Supply of Coal

A coal gasification plant is introduced ahead of the coal combustion plant to be installed. The coal gasification plant operates at atmospheric pressure and also following the principle of the circulating fluidized bed, and is designed very simply. The fuel gas produced by the addition of steam and oxygen has a heating value sufficient for operation of the existing calcination installations and other smaller users. Coal is only partially combusted. The unreactive components still containing a large amount of carbon do not, however, constitute a loss in the overall process because they are introduced directly into the fluidized bed combustion installation and are there burned with essentially complete utilization of their residual energy content. Additional emissions do not arise through operation of the gasification plant because the leftovers from fuel gas purification can also be rendered environmentally harmless by means of combustion. The requirement to use the most varied--and also very unconventional--fuels for energy production with regard to present-day environmental standards, high energy conversion efficiency and flexibility in the choice of fuel makes a test of the fuels on an essentially industrial scale absolutely necessary.

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CSO: 3102/137

BRIEFS

GASIFICATION PROJECT NEWS--(1) In France Charbonnages de France, with GEGS [Underground Gasification Study Group] is perfecting at Vendin-le-Vieil the sequel to in situ gasification experiments conducted in 1980-81 at Bruay-en-Artois. The program is in process of setting up and should be further defined in coming weeks. It will be operational early next year. The first step will repeat the experiment performed at Bruay in a deep gas producer, but will start this time from the surface rather than from a pre-existing gallery. Operations will thus focus on fracturing*, retrocombustion*, and surface recuperation of gas produced. The stage of methanization (transformation of the gas to methane) on the surface is not planned in the project. (2) The board of directors of Gaz de France has decided to build a coal gasification plant at Le Havre. Capacity, 1,000 tons of coal per day for 300 million cubic m per year; cost, Fr 550 million; building time, 5 years. (3) For Mobil and Ruhrkohl in West Germany, the Fluor firm is studying the technical and ecological feasibility of a plant to utilize three processes, the first to produce gas exclusively, the other two to produce gas and motor fuel. (4) In Belgium, the underground gasification experiment envisaged at Saint Ghislain will be delayed in its planning. Lighting to connect bore holes will not be done until December, or tests until the spring of 1982. [Text] [Paris SCOOP ENERGIE in French 15 Dec 81 p 10] 6145

NATIONAL SYMPOSIUM ON RESEARCH, TECHNOLOGY LAUNCHED

Paris AFP SCIENCES in French 14 Jan 82 pp 1-8

[Report on national symposium on research and technology: "Policy and Organization of Scientific Research," held in Paris on 14-16 January 1982]

[Text] Paris -- Mr Mitterrand: Research, "key to renewal" to get us out of the crisis. On opening the national symposium on research and technology, President Francois Mitterrand forcefully emphasized the essential role which research must play as a means to get out of the crisis and as a tool for the future.

"We must get out of the crisis, and research represents one of the keys, perhaps the key, to renewal," emphasized the head of state. "A gigantic research effort alone will allow France to find a place among the few rare nations which are capable of controlling their technology and, in the final analysis, to preserve their independence."

"The struggle will be hard," noted Mr Mitterrand. "We have to start with an act of will, and accept as inescapable neither the economic reports of domination, nor the international division of labor as it is today."

Stressing that the symposium represents "the first and most vivid manifestation of this will," Mr Mitterrand added: "Everyone is well aware that this is a political stake in the noblest sense of the word, because all of us together must invent new relationships between man and science."

Expressing his faith in science, "a science at the service of man, but not the reverse," the president of the Republic brought out "the very strong support" of all those who believe in the future development of research and technology, "a major ambition of our policy." "If we want to govern our future and not become its toy, we will have to resolutely and clearly exploit our principal wealth: that reserve of dynamism, of movement and of independence which makes up a highly motivated and high quality scientific community."

Next, Mr Mitterrand recalled the measures which have already been taken, such as the establishment of a large Ministry of Research responsible for this mission of being "an advocate for the future," the budgetary commitments through which the civilian research budgets will increase by 25 percent as of 1982, the decision to increase research spending up to 2.5 percent of the gross domestic product in 1985, and so forth... He recalled that the vast national debate, illustrated by the symposium, would lead to the orientation and planning act which Mr Jean-Pierre

Chevenement will propose to the government, and which will be submitted to parliament next spring.

This law, specified the president of the Republic, will program the large masses of financial effort for research for the coming years and will provide this activity with the framework it needs: it will establish the role and social function of the research professions, it will renew and expand the means for the formation of the scientific and technological professions, and it will adapt the national and regional organization to the requirements of decentralization.

"I would like to see it very deeply inspired by the desire, which this symposium bears witness to, to place research where it should be placed today; not in an isolation which would confine the researchers to their centers and laboratories, but at the crossroads of all the big problems of our society."

"Because, if the creativity of all those who participate in our scientific and technological development needs a large freedom to blossom, if creativity cannot be imposed, then it will be really prolific only in a symbiosis with the concerns and evolutions of the nation. Indeed, history has widely shown that the strong periods of evolution of our societies and our cultures most often coincide with the strong periods of scientific thought, and that in those periods the work of the researchers was influenced by the ideas and forces passing through society, as they themselves also influenced them."

Speaking about the necessary opening of the world of research to the outside, whether to society, the economy, foreign countries, the Third World, etcetera, the president of the Republic stated the following:

I. "Opening of the world of research to the economic world: a rich dialogue between researchers and their economic environment is an absolute necessity for the future of our research. Hence, we must increase the means for this dialogue, for cooperation between research and industry, and for the mobility of researchers."

"This way, the researcher will be able to participate more actively in the transfer of knowledge to the users and in its implementation in society."

II. "Opening also to our society in its democratic expression: here again a vital necessity has been neglected far too long. We want research and technology, their evolution and their consequences, to be better known by those who have to make decisions for the community, and we want researchers to explain their hopes and fears, and submit to political reflection the controversies which result from the evolution of knowledge. But we also want the researchers, the innovators, the technicians to be aware of the large objectives set by the country. Today, they must know in what direction we are working to get out of the crisis: to recapture the domestic market, to ensure employment, to reduce inequalities, to improve labor conditions, to create new relations with the developing countries, all of which are concerns which those whose mission it is to create the tools for the future must be familiar with."

"Among the means necessary for this dialogue between political officials and research, I have suggested the establishment of an office for the evaluation of technological choices, which would allow the elected officials to have those elements

necessary for the making of important decisions, which involve the future of the country, at their disposal. It is now up to parliament to endow it."

"At the same time, the decentralization effort embarked upon by the country will lead to a greater participation of the regions in the important scientific and technological choices. Hence, these communication procedures must also be developed at the regional level, and for each region according to its special situation. The state will respond to the obvious desire of the regions to participate in the large scientific and technological effort by associating them with the preparation of national choices and by helping regional actions which contribute to their realization."

"These developments are in keeping with the demand for democracy expressed by the country and which this symposium should debate extensively: it is indeed inseparable from the establishment of new relations between the world of research and technology and the political powers."

III. "Finally, opening to the outside world. It is very important that one of the themes of the symposium has been devoted to the international stake. For a long time, scientists and technologists have known to what extent the success of their work is expanded by exchanges with those who conduct parallel or complementary work everywhere in the world. They want extended and effective contacts, and they can be relied upon to develop them. They should know that it is our wish to support them on this road, and to make sure that structures and regulations do not hinder this."

"This concern for an international environment which conditions our evolution, and with regard to which we must define our action, must be present in the minds of researchers, industrialists, and politicians alike. There are plenty of questions when we think about this area. The government has already indicated the roads it intends to take. But we are far from having solved all the problems at the various levels at which they appear. I will touch on three of them:

1) The European level. We belong to a community of peoples who are close in terms of their culture and in terms of their responsibilities in the face of world problems. To these challenges, these responsibilities, they must attempt to provide a common response and to prepare the future together. It has been proven that a fruitful cooperation is possible: European achievements in the fields of aeronautic construction and of space show that Europe can be successfully present where the future is being prepared. This is why France has made proposals for a revival of European ambition, specifically in the area of research."

2) "The level of tough competition waged by the industrialized countries, old or new. Everyone is aware now that one of the main assets of this competition is innovation. Far from trying to protect ourselves from it, we should on the contrary mobilize our intellectual and industrial resources to play an active role in it. It will be an essential act of our technological development policy to contribute to it by relying on the role as a moving force assigned to the national enterprises and by furthering the sources of innovation which are so numerous in the small and medium sized enterprises. Do detect these innovations, see to it that they are supported and developed, and make sure that the large enterprises play their role of driving force in keeping with the national interest: these are actions which

the public authorities will have to take, and to which I am convinced that this symposium will be able to contribute valuable suggestions."

3) "Finally, the level of the Third World and of its necessary development. True, a goodly number of disappointments have marked these last decades. They should not lead us to despair, but rather to recognize that the efforts made to transfer development tools to those countries have lacked a basic requirement, that of adapting them to their cultural individuality. It is by trying to respond to the needs of these countries, by helping them express their demands, by being attentive to their search for a development adapted to their situation, that we will be able to contribute usefully to their development. At the same time, the intellectual riches of those countries, which have been smothered by a type of development imposed from the outside, may on the contrary become a contribution to the development of world science."

"France has a significant role to play in this effort to place science at the service of development. It makes it possible to link the most modern technological know-how with the cultural wealth of the Third World countries. New methods will have to be developed to join together research efforts, as we decided to do with India through the establishment of a common research center."

Speaking about the large mobilizing programs, the president of the Republic said: "I have asked the minister of state for scientific research and technology to study the launching of mobilizing programs. As a matter of fact, he has already, within this framework, put in place a certain number of missions, the conclusions of which I would like to have rapidly examined; other suggestions will come out of this symposium. Indeed, it seems to me necessary that initiatives be taken and long term actions be undertaken."

"This concerns first of all certain major areas, guarantors of the future, which France must learn to master for fear of losing its independence and its competitiveness. I would like to cite, as an example: electronics, certainly; computer science, which is considered important and which has led me to decide on the establishment of a world center for microcomputers in Paris; the rational use of energy, at the heart of our country's autonomy; and biotechnologies, which are present virtually everywhere."

"It will also be a question of getting the full measure of the major national aspirations: improvement of labor and employment conditions, improvement of public health, scientific and technological cooperation with developing countries, development of communications and diffusion of culture, and the promotion of French as scientific language."

"The launching of mobilizing programs will involve our basic industries, those which sustain our economic fabric and ensure employment. Indeed, the distinction between key sectors and traditional sectors is no longer very significant; henceforth, all activities will call on more and more advanced technologies, which are the condition of their survival and their development."

"I am thinking specifically of three branches in which research is immediately imperative: the construction of housing to give the French the life style they

aspire to, the agricultural food industry which exploits an essential part of our national heritage, and finally the mechanical engineering industry which contributes to all industries."

"This list is neither intangible nor exhaustive; the work at the symposium will be able to specify its outline... knowing, however, that in becoming too long it would lose its meaning."

"I would like to tell you the particular value I place on seeing that biology be placed in a leading position in science and its applications. The study of life has been at the heart of human concerns since the most distant times, but its scientific blossoming has only come about during the last few decades, thanks to a renewal of ideas to which French researchers have widely contributed. This effort should be continued and expanded in order to enable the development of knowledge and the implementation of opportunities which offer great hopes, such as biotechnologies."

In conclusion, Mr Mitterrand stated: "In the future, France will be the great country its genius demands only if it is able to reconcile its entrepreneurs, its workers, its researchers, its administrators and its artists with a passionate search for a cultural project for the 21st century. Such is the unique ambition which should, if possible, make France a democracy in the 20th century. To ensure that science, in all its forms, serves a single goal for France and for the world: to expand freedom."

"Indeed, to reduce the suffering of mankind is to expand freedom, to improve the knowledge of the universe and of matter is to increase freedom, to bring about progress in chemistry, astronomy, physics, biology or even anthropology and linguistics is to increase freedom."

Earlier, Mr Jean-Pierre Chevenement, minister of research and technology, paid a vibrant tribute to the president of the Republic by recalling that, as of 22 April 1981, at the time of his press conference in Luxemburg, "he had given the impetus, and with such forcefulness" and assigned objectives "with such precision," to the development of research.

Mr Chevenement declared:

"Of the 10 main objectives you indicated, several have already through your impetus become a reality:

- To create a large Ministry of Research, which would bring together the means scattered and dispersed among several ministries? This has taken shape.
- To restore basic research, "the milk of life"? The program permits granted to the CNRS [National Center for Scientific Research], to the research mission of the universities, to INRA [National Institute for Applied Research] and to INSERM /National Institute for Health and Medical Research/ have begun to ensure that we will catch up. This effort will be continued.
- To build mobilizing programs, to improve and rationalize the relationships between research and industry in order to regain the domestic market and preserve our independence?

It is a decisive part of the policy which is being developed.
- To cultivate the taste for research and to provide scientific information to the French people?
It is the task of the interministerial task force for the diffusion of scientific and technological information, which has been restructured and provided with increased resources.
- To establish new European programs, and put research in the service of new kinds of relationships with the Third World countries?
This has been started, even if the results are still modest.
- Finally and primarily, you wanted, Mr President, to break the isolation of research."

"The researcher, you said, must multiply his contacts with the citizens, with his colleagues and with other disciplines, with the worlds of education and of business. This is an absolute priority. It is up to us, up to you, to find the methods, the structures, the procedures which will make it possible to reach that objective."

"The vast repercussions of this symposium are the most obvious evidence of the fruitfulness of the indicated direction."

"The fact that in such a short period of time, so many obstacles were overcome, or are in the process of being overcome, is the mark of a change which the people have gradually come to believe in. And this may be the most moving thing -- in the real sense of the word -- about this symposium -- a modest undertaking at the start, for something which over the months became a vast intermingling of men and ideas, and which constitutes -- an unprecedented fact -- both in France and abroad, a real 'States General of research and technology.'"

Mr Francois Gros, president of the organizational committee for the symposium, who spoke at the inaugural session, concluded as follows: "Will these two last decades, marking the end of the millenium, have the moroseness of 'lost illusions,' or will they really coincide with the beginning of a new era for research and technology, culture and science, the beginning of a new alliance between the world of research and the vital forces of the nation?"

The symposium is to end on 16 January with a major speech by Prime Minister Pierre Mauroy, and an important speech by Mr Jean-Pierre Chevenement, who will explain the law on the planning and orientation of research and of technology.

During the afternoon of 15 January, numerous political and trade union personalities will take part in the plenary sessions of the symposium. Among them, Guy Hermier (PC [French Communist Party]), Lionel Jospin (PS [Socialist Party]), Michel Pinton (UDF [French Democratic Union]), Alain Devaquet (RPR [Rally for the Republic]), Micel Rolant (CFDT [French Democratic Confederation of Labor]), Rene Le Guern (CGT [General Confederation of Labor]), Robert Cottave (CGT-FO [Workers Force]), M. Fillon (national union of PMI [Small and Medium Industries]).

It will be recalled that more than 40,000 people participated in the 31 regional conferences of science and technology. Half of them came from the public research sector, 20 percent from industrial circles, and 30 percent were elected officials, representatives from union organizations, from various associations, etcetera...

Some 10,000 15 page documents, or a total of 150,000 pages, of grievances, of proposals and concrete suggestions, etcetera... were published on the occasion and at the conclusion of these conferences. They have given birth to a first series of 950 synthesis reports and 12 introductory reports, each about 50 pages long.

These 12 reports, which correspond to the 12 main themes of the national symposium, will form the basis for the debates, in committees and in plenary sessions.

The work of the symposium should in a way "enrich" the bill on the planning and orientation of research and technology, which has already largely taken into account the main ideas which have emerged during these conferences. They will be recorded in a nearly 2,000 page document, which will probably be published by Documentation Francaise.

The officials in charge of the symposium came up against a problem, among others, which was very delicate, the problem of participation in its activities. Eventually, the maximum that could be invited were some 1,200 representatives from the regions and from research bodies. Approximately 20 to 30 foreign scientists also received personal invitations, mostly from European and French speaking countries.

In conjunction with the symposium, an exhibition on the theme "Research and Technology: a Choice for the Future" was organized by the Maison de la Radio, where more than 100 demonstrations to transform the daily life of the French, were presented to the public. Finally, a "National Open Doors Day" at the laboratories is scheduled for 16 January, during which the scientific and industrial community is being mobilized to demonstrate, in about 100 laboratories, French research potential.

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CSO: 3102/136

SODIUM-SULPHUR BATTERY PROMISES FUTURE FOR ELECTRIC CARS

Heidelberg ELECTRISCHE ENERGIE-TECHNIK in German Nov 81 pp 11-12

[Article: "Hope Placed on Sodium and Sulphur"]

[Text] Apparently there is a deep-seated prejudice against the electric automobile due to its limited range. When batteries are compared to the gas tank on the basis of range and weight, the gas tank is clearly superior. But there are other considerations.

The average auto in the FRG is driven 14,000 km per year. If this distance is divided by the 250 working days per year, then the average per work day is 56 km. Using 365 days, the daily average is just under 39 km. Lead batteries are equal to this task right now (Figure 1).

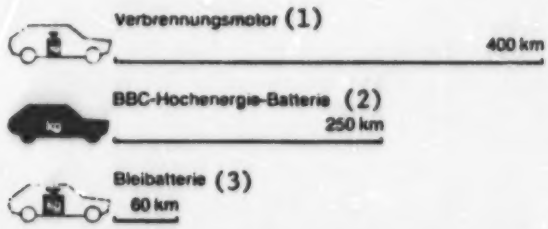


Figure 1: At the same total weight, an electric car with lead batteries can go 60 km; one with Na/S batteries 250 km; and the classical auto with internal combustion engine can go 400 km, but this range advantage is seldom used.

Key to Figure 1:

1. Internal combustion engine
2. BBC high-energy battery
3. Lead battery

Actually, it is reasonable to project that the concept of range will change in relation to the electric auto. In the case of the gasoline-powered auto, range is purchased at the filling station. For example, one may buy 20 liters--enough to go a certain distance or to last a certain number of days. For the electric car, range is bought up front in the form of batteries. This introduces a new yardstick. For the electric car, it pays to buy only what is really needed plus a margin of safety.

This emphasizes the fact that the electric car is a short-range vehicle. Present transportation figures show that 82 percent of all trips are less than 20 km and 90 percent are equal to or less than 50 km.

The criticism of the present electric car is nonetheless justified. Even its proponents are not satisfied with the performance of lead batteries, even though they result in practical, useable vehicles. The lead battery has disadvantages: It is too heavy, having low energy density; it is too expensive and, moreover, lead supplies are limited. There is only enough to last for about 30 years. Thus, the move away from oil will not be led by lead.

Worldwide, engineers are looking for new solutions. New laboratory models are presented at regular intervals. But this usually does not mean a great deal since between thelaboratory model and daily use lies the difficult technical-development phase which also includes the production process. Many good ideas run aground during this phase.

Only one new battery has reached production maturity: the sodium-sulphur battery. A small pilot production facility in Heidelberg is producing these energy storage units brought to maturity by BBC. The battery may achieve practical importance within a few years (Figure 2). Sodium and sulphur are cheap and abundant. Sodium (Na) is present in common salt; sulphur (S) generally occurs in combination with iron as iron pyrite or marcasite. Batteries made of Na and S are, to be sure, of unusual construction. Conventional batteries consist of two solid materials--zinc and pyrolusite in the case of flashlight batteries--separated by a liquid electrolyte. The Na/S battery has a solid electrolyte, namely a special type of clay, while the sodium and sulphur must be in liquid form. This means that the battery operates only at high temperatures--in the range from 300 to 350 deg C, to be exact.

Figure 2: Production of the electrolyte tube for Na/S cells at BBC in Heidelberg. An aluminum oxide spacer ring is being mounted on a tube.

Figure 3: Assembly of a Na/S cell; at 2.1 V its terminal voltage is slightly above that of the lead battery.

The individual cells consist of the alumina container in the shape of a test tube which holds the sodium and which is surrounded by sulfur (Figures 3 and 4). Sodium ions migrate through the alumina container and leave behind free electrons. Outside they receive electrons from the sulphur, forming sodium sulfide. The process produces an excess of electrons in the alumina container and a deficiency of electrons outside the container. The charge is neutralized as electrons flow from the sodium to the sulphur through the external circuit of the electric car.

The process is reversible. If an electric current is sent through the cell in the reverse direction, it decomposes the sodium sulfide. The sodium ions migrate back through the tube, take on electrons and again become sodium atoms. This charge/discharge process can be repeated at least 1,000 times; British experts hope even 2,000 times. This means that the Na/S battery has an unusually long life.

4 Aufbau einer Zelle des Na/S-Akkumulators. Beliebig viele solcher Zellen können zusammengeschaltet werden

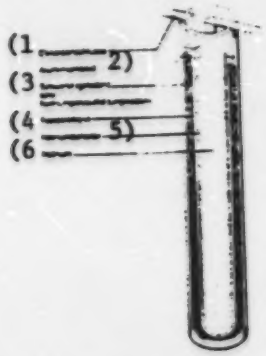


Figure 4: Construction of a Na/S-battery cell. Any number of such cells can be connected together.

Key to Figure 4:

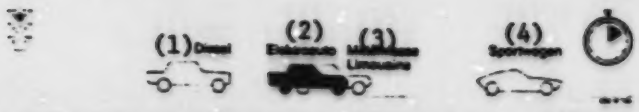
1. Terminals
2. Aluminum oxide
3. Sulphur (charged) or sodium polysulfide (discharged)
4. Solid electrolyte
5. Sodium container
6. Sodium

Neglecting the operating temperature aspect, the Na/S battery offers nothing but advantages compared to the lead battery:

--30 to 50 percent cheaper,
--About 10 percent higher charge/discharge cycle efficiency,
--4 times as much energy storage per unit mass,
--Non self-discharging,
--Nongasing,
--Twice the life, and
--Power to weight ratio of 100 W/kg compared to 60 W/kg, thus capable of driving a higher-powered motor for the same battery weight.

The high operating temperature is not necessarily a disadvantage. It requires very good insulation so that the electric car can be parked unused for several days without the battery having to be reheated. The insulator acts as a shock absorber which protects the battery from damage during an accident.

With the weight of a tank of gasoline which provides a range of 400 km for a medium-sized auto, the Na/S battery provides a range of 250 km. It can drive a 40-kW motor which achieves 130 km/h and accelerates the vehicle from standstill to 50 km/h in 7 seconds (Figure 5).



5 Elektroautos mit Na/Batterien beschleunigen in 7 s auf 50 km/h und übertreffen damit den Pkw mit Dieselmotor (Bilder: BBC)

Figure 5: Electric cars with Na/S batteries accelerate to 50 km/h in 7 seconds, out performing diesel-powered automobiles.

Key to Figure 5:

1. Diesel
2. Electric car
3. Medium-sized passenger car
4. Sports car

This performance about equals that of a medium-sized auto with a gasoline engine, but the electric car would have the advantage of a much longer life. The battery lasts for 200,000 to 250,000 km. The life of the electric motor and the electronics is even longer; thus, electric cars would have a long life; and, without question, they would preserve the environment. For, while a normal gasoline-driven auto discharges 40 g of pollutants into the atmosphere for each km, the electric car discharges only 3 g thanks to the central energy production in power plants. This figure applies, of course, to fossil-fueled power plants: Other types of power plant reduce air pollution even further.

It may be that the Na/S battery will not gain a foothold through the electric car; however, according to the developer, it is competitive today with the most efficient power plants, and it would without doubt lower the cost of wind-power plants. If such expectations are fulfilled, the future of the Na/S battery will be assured.

9160
CSO: 3102/130

RESEARCH WORK IN ADVANCED AUTO DESIGN REVIEWED

Bonn DIE WELT in German 16 Jan 82 p 17

[Article by Heinz Horrmann: "Research Vehicles: Technology for Production Tomorrow"]

[Text] Naturally, there were overtones of admiration but scepticism predominated. Cars of the future or research vehicles were always dismissed as "dream cars" at the time they were presented because they were nowhere close to production status and never had a chance of being built in that form. That was the case for decades. There has been a radical change with the newest generation of engineers' studies for the year 2000 and beyond. It makes no difference whether one considers the "cars of tomorrow" from the three German companies Daimler-Bens, Volkswagen and Audi NSU, which were built with government funds from the project "Auto 2000" or the studies from Citroen, Renault (with money from the French government), the Ford "Probe III" or Opel's "Tech I." All of them look very futuristic and winningly aerodynamic, but equally "suitable for the road." That is particularly true of the "Uni-Car," the remarkable car of the future developed by four technical universities, the fourth prototype being built with a German research grant. In its shape, the Uni-Car bears a slight resemblance to the VW "Auto 2000." However, the university work group placed special emphasis in the design of the bodywork on accident protection for pedestrians and bicyclists. The front of the car has a 5-centimeter-thick section of foam over the metal to prevent injuries in an accident.

In contrast to the cars from the manufacturers, the university study was not given its own engine. Instead, a Citroen 4-cylinder diesel engine was modified. Thanks to the excellent aerodynamics (C_d less than 0.30), the university planners believe a top speed of 190 km/hour can be reached without great power and a fuel consumption of 6.5 liters/100 km (combined cycle) can be achieved.

If only external appearance is taken as the criterion, the university research vehicle is not nearly as spectacular as the "competitors" from the car companies. Citroen took the biggest step forward with its "Styling Exercise" for a low-built coupe. In this car of the future, the driver's seat is in the middle, all the controls are grouped around the steering wheel and the passengers sit to the left and right of the driver.

German companies also achieved C_d figures below 0.30 with their prototypes, but otherwise they remained more conservative--both in overall design and as far as the engine is concerned. In their research work, Audi, Mercedes and VW skillfully avoided competing with each other. Daimler-Benz--what else was to be expected--built the comfortable long-distance sedan for the year 2000, 5.10 meters in length and weighing 1,600 kg. Two gas turbines of 128 horsepower, a turbocharged 6-cylinder diesel engine and a conventional V-8 gasoline engine are planned as possible power plants. Fuel consumption is said to be 6.7 liters/100 km (at 120 km/hour) with the turbine and 7.5 liters/100 km with the diesel.

The Volkswagen engineers in Wolfsburg were intent on building an extremely small and light vehicle. The tiny aerodynamic car is driven by a 45-horsepower, 3-cylinder turbocharged diesel engine. Consumption is said to have breen brought down to 4 liters/100 km.

Audi NSU concentrated on a middle-class automobile. The 4.8-meter-long car, designed as an ideal vehicle for a family of four, was given styling that would scarcely be out of place in traffic today.

Under a contract from the French Ministry of Energy, Renault developed the EVE (Economy Vehicle Elements) research vehicle with exactly the same "family plan." The highly elegant sedan achieves a coefficient of drag of 0.23 in the wind tunnel without any visible aerodynamic aids. That means a fuel consumption 30 percent less than the R 18.

The external shape of Opel's research project was derived with the aid of computers. All-round glass is joined flush to the bodywork. The glass also covers the roof pillars and prevents air turbulence along the sides. Only a detail, but such meticulous aerodynamics, which is also evident in the full-length underbody pan, helps the car achieve exemplary economy and better usability in everyday driving.

Ford's "Probe III" gives the strongest impression of being close to production. Although many new engineering ideas for the future were released, equal attention was given to a high degree of functionality and careful detail. A prominent double spoiler on the tailgate not only resulted in better airflow but also made it possible to keep the rear glass clean. What still seemed like a pipe dream when the advanced Ford study was first shown is already standard in the successor to the Taunus, which will be introduced in September. The "Sierra" is nothing more than a slightly altered "Probe III" car of the future.

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CSO: 3102/146

END

JPRS 80361

19 March 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 96

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JPRS 80361

19 March 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

No. 96

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BRIEFS

SAGA-HOECHST RESEARCH AGREEMENT--Saga Petrokjemi and the West German Hoechst Chemical Company have reached an agreement on a joint research project to increase expertise in Norway in the field of biotechnology. The project will be carried out within the framework of Norwegian-German agreements and 12 million kroner will be requested from the West German Research Ministry for the project, according to SAGA-NYTT. The planned research project will concentrate primarily on increasing and protecting Norwegian cod reserves by the artificial breeding and feeding of young cod. This would complement a larger research project in which Norwegian authorities are involved. The Saga-Hoechst project originated in the work previously done by Saga Petrokjemi on single-celled proteins. These are proteins produced with methanol in a biological process. Through cooperation with the Central Institute of Industrial Research, Saga gained experience in the use of such proteins for fish food. The Saga-Hoechst project may create and develop new markets for single-celled proteins. This will be important for evaluating possible future Norwegian production of such products from methanol by the two companies. [Text] [Oslo AFTENPOSTEN in Norwegian 11 Feb 82 p 16] 9336

CSO: 3102/148

CHEMICALS

PLANT WASTE USED AS FEEDSTOCK FOR PLASTICS MANUFACTURE

Zurich CHEMISICHE RUNDSCHAU in German 20 Jan 82 p 3

[By Rudolf Weber: "Car Doors From Corn Stalks?"]

[Text] Life today and in the future without plastics is no longer imaginable--from the automobile steering wheel to nylon stockings to dentures. For the most part they are produced today from petroleum so that plastics also become increasingly more expensive with the cost of petroleum. But, of course, coal can be used in place of petroleum as the basic material, yet it too is likewise involved in price increases. As everyone knows, necessity is the mother of invention, thus many researchers are looking around for new, cheaper basic materials. At the Advanced Technical School in Manchester, England, they are pursuing the route of obtaining plastics from plant waste. To be sure, this is basically not new because for decades wood has been used as a basic material for a number of cellulose plastics for packing papers, glasses frames, film and tape carriers or ping pong balls. However, the virtually unlimited variety of properties--from the softness of a foam to the hardness of a rocket material--which is possible with plastics from coal and oil, cannot be applied to these plastics. The research group in Manchester hopes to be able to make cellulose plastics equally versatile. Thus, it is aiming its efforts at the principle according to which all plastics are developed: a large number of chemically similar basic elements is linked or interlaced into giant molecules, the polymers (Old Greek: multiparts). In any case, the starting point is the basic materials, called prepolymers in technical language. In order to obtain them from beet leaves and corn stalks the researchers in Manchester first obtain cellulose from them, the building material of cell walls. In the next step the cellulose, a natural giant molecule, is broken up with the help of agents into smaller molecules, cellodextrins. These in turn can be transformed into prepolymers of the desired kind by "attaching" chemical compounds and finally they can be interlaced or linked into the actual plastic.

What appears obvious in such short sentences, is full of scientific and technical tricks. Nonetheless, in Manchester where the work has been going on for years apparently some major obstacles have been overcome. For example, they have succeeded in breaking down almost 99 percent of the cellulose into cellodextrins. And in the next 3 years the goal of "solar energy plastics" with a broad array of properties should be widely achieved. Among insiders this is how plant plastics are called because the initial material is formed from plants with the help of sunlight. They are to be used for technical components, for example, automobile

bodies, boats, and even airplanes. In order to provide them with the necessary rigidity and strength, fillers must be added to them--as to all plastics--(for example, chalk dust and glass fibers).

Even if there were success in meeting all these expectations for plastics--as in the case of space heating and automobile drive--the new materials will not be able to replace oil overnight. Experts estimate that in the no longer so distant year 2000 solar energy plastics will account for 10 percent of all plastics produced at that time.

12,124
CSO: 3102/142

ENERGY

MULTIPLE-FUEL FLUIDIZED-BED REACTOR DEVELOPED

Oslo AFTENPOSTEN in Norwegian 15 Jan 82 p 21

[Article: "Multiple-Fuel Reactor Developed at Hamar"]

[Text] Better combustion systems are key words in the debate over future energy usage. There are few problems involved in burning pure oil and gas with high efficiency. It is not so simple, however, with fuel such as wood chips, peat, bark, household waste, and other types of waste. There are also problems involved in burning low-grade coal with high efficiency. In this connection, many researchers have put great faith in a combustion technology called fluidized-bed combustion.

For many years this combustion technology has been used with varying degrees of success. It is generally accepted that the technology has many advantages, but it also has certain weaknesses. The obvious advantage is that many types of fuel can be burned in the same furnace. One of the main problems is how to remove the lumps of ash that are formed without shutting down the furnace.

Now this problem has been solved by Hamjern A/S in Hamar and this company has patented the solution. Other minor problems also have been solved in the new furnace that Hamjern is offering in sizes ranging from 2 to 20 MW (equals 1,000 kW). The first pilot plant has been in operation at the Hamar factory just under 1 year and it soon will be ready for marketing. Among those interested in the new furnace is Sweden's largest private power producer, Sydkraft.

Senior engineer Nils Ivar Viken and civil engineer Odd Egil Solheim of Hamjern are behind the project. They point out what a great advantage it is that all types of fuels may be used in the furnace, since at any given time it is possible to use the fuel that is cheapest. It is also possible to combine several types of fuel at the same time, for example one half waste and one half coal may be used. Such a facility is especially well suited for use in district heating plants where one of the fuels used is waste. This special combustion technology also provides unusually high efficiency, about 85 percent. Another advantage of this special combustion

technology is that emissions of polluting materials can be controlled and greatly limited. This is especially true of nitrogen oxides and heavy metals. With other special devices, the emission of sulfur compounds and hydrochloric acid may be kept at an extremely low level.

In addition to use at district heating plants the multiple-fuel reactor, which Hamjern calls its fluidized-bed furnace, is also well suited for use in boilers in industries with some type of waste that can be burned. This is true in the lumber industry and in sections of the chemical industry. Hamjern is prepared to deliver these units complete and according to plans all production will be in Hamar.

Development of the Hamjern fluidized-bed reactor has been supported by the Oil and Energy Ministry's budget for prototypes of new energy sources.

CAPTION

The multiple-fuel reactor developed by Hamjern A/S can be "fed" with coal, as engineer Johan R. Rasmussen is seen shoveling here, wood chips, ground household waste, and other sources of energy. On the right, civil engineer Odd Egil Solheim is seen by the patented reactor, developed by him and senior engineer Nils Ivar Viken.

9336
CSO: 3102/148

SCIENCE POLICY

REPORT ON NATIONAL CONFERENCE ON RESEARCH, TECHNOLOGY

Paris ARP SCIENCES in French 21 Jan 82 pp 1-13

[Text] PARIS -- The "French model" of research and technology organization. M Jean-Pierre Chevenement, Minister for Research and Technology, in lengthy remarks at the closing session of the national research conference, held from 13 to 16 January, spelled out what he called the "French model" for organizing research and technology.

This model, "taking social demand into account in matters of research," and citing "our country's multinational heritage," ventures the following predictions:

a. Our way of handling research, says M Chevenement, must be made more democratic at every level. At the national level, in line with President Mitterrand's commitments, the government will ask Parliament to take the initiative and establish its own Office for Evaluation of Technological Decisions, so as to make available to the nation's elected representatives the objective elements requisite to a democratic debate. Its board could be made up of members of Parliament. It would have a scientific advisory council and its own budget.

b. The orientation and planning bill must make provision for establishment of a high council for research and technology in the research and technology ministry. It might be chaired by the minister for research and technology and half its members would be appointed at the recommendation of universities and of all partners in research (business, labor unions, professional organizations, association movements, etc.), and the other half would be chosen from among competent leading figures in the various scientific and technological disciplines.

It would be mandatory to consult the council on all reports on the look of the future and current state of science and technology, and on major issues in scientific and technological policy. It could formulate proposals and set up special study commissions.

c. At the regional level, advisory committees on research and technology attached to the regional councils would open the way to democratic debate on the regions' scientific and technological options.

These advisory committees could advise the regions in liaison with the regional delegates from the ministry for research and technology on

the establishment of regional technology magnet centers. The ministry can find money in its own budget to support action taken at the regional level when such measures fit in with the priorities for national action.

d. In the public research agencies, future reforms must move in the direction of greater democracy: the governing boards must include representatives elected by employees and some representation from outside the agency; the scientific councils and the statutory arbitration bodies must also include elected representatives of the employees, who will sit side by side with appointed council members.

e. In the end, the conference has demonstrated the broad value of debates on the orientation of research taking place within corporations. It might be necessary to make provision, particularly in the national corporations, for the company committees to hold regular discussions on the company's orientation with regard to its policy on corporate research. A scientific committee might possible be attached in specific instances to the legal structure of the corporate or plant committee.

Some have mentioned French-style quality boards. That message has been received. Our model of democracy must guarantee effectiveness by assuring that needs are made known at the top and that information circulates freely.

Furthermore, the minister continued, in so far as research specialties are concerned, they must be given status commensurate with the role research already plays in the whole domain of development and research. Government research specialists will be active simultaneously or subsequently in the functions of research, of teaching, of administration and upgrading research within government agencies or in private enterprise. With that goes a general obligation to spread scientific and technical information. The bill will lay down the general principles concerning first the guarantees attached to these specialties, equivalent to those for a reformed civil service. Once it becomes clear that research ought in fact to bathe and refresh all of society and that research people must mobilize in the laboratories, in the educational institutions, and in private enterprise, that mobilization, coupled with voluntary mobility, must perforce entail in return guarantees of employment and career, and of social rewards, particularly conditions of retirement.

Negotiations with the unions will begin within a few weeks. They will bear equally on the specific rules governing hiring, advancement or career promotions in government research agencies and on support for the latter. A special model statute might be written, to apply initially to staff at the National Scientific Research Center (CNRS) and at the National Health and Medical Research Institute (INSERM). Evaluation of researchers' performance would take into account all their activities in research, and in follow-up and passing along the fruits of their discoveries. Collective bargaining contracts in corporations should recognize the worth of training in research and the role of scientific workers.

Personnel regulations in the various public research agencies, while retaining their specificity, shall be suitably adapted to permit free circulation of personnel both within and among public agencies, teaching establishments, administrations, and companies, including nationalized companies. A special cell responsible for organizing exchange programs for scientific personnel among the various sectors of national activity will be set up at the research and technology ministry.

Of course, M Chevenement pointed out, scientific employment policy is an essential component of reform and renewal. Creation of new positions at the rate of 4.5 percent over the next few years will allow us to get the average age in our laboratories down to a slightly more youthful level and, I hope, improve the career outlook for all researchers.

It goes without saying that there can be no research and technology policy without a training policy. A major goal must be to attract more and more of the younger generation into research, and it is with this end in view that training for and in research must be systematically developed. Entry through research, backed by a system of scholarships considerably more prestigious than those now available, far more diversified, and far more generous, will be institutionalized in the universities, in the engineering schools and in the major scientific centers, as well as in research agencies or in corporate laboratories. We must of course underscore the fundamental role played by the university graduate schools in training through research.

In the area of tomorrow's sciences (biotechnologies, or microelectronics, for example) specific training action will be undertaken. A monitoring center for research flows and achievements will be set up in the research and technology ministry. Its mission will be to provide all necessary information for a consistent long-term policy of training through research.

Development of industrial research calls for training a lot more engineers through research. We must try to double that number by 1985, setting as our goal 1,000 engineers with research training and background by that date.

When you come to think of it, have we any more formidable adversary right now than fatalism and surrender in the face of the crisis?

And isn't the challenge that has been flung down to us the challenge to mobilize our people, to give them hope and strength of purpose, in a word to give them back their taste for action? To do that, we must first of all understand, and then help others to understand.

Besides all this, if we are to succeed, we must lift the human and social sciences out of the discredit into which they have knowingly -- if I may be so bold as to say so -- been plunged. Mistrust of science, once its object is no longer nature, only recently set free, for that matter, of its concern with basing human order on the order of things,

but has become society itself, that mistrust of what are called the social sciences is still distrust of man himself. Refusal to know always cloaks rejection of change.

The human and social sciences of recent years have taken particularly heavy fire. Mistrust and neglect combined have begotten the malaise we are only beginning to see a way out of, as your rapporteur so cogently pointed out.

A high-priority mission will shortly be assigned, predicted M Chevenement, to chart clearly and accurately, both on the material and moral levels, the ways and means to the necessary restoration of order.

There is no question but that this will be a lengthy task, but one in which essentials are at stake, since it amounts to nothing less than to give democracy a new content, a new meaning.

The challenge calls on us to place at the very heart of democracy the questions science poses, but also the things it does. (...) A tremendous effort at gathering specialized data -- data banks, scientific publications, editions of the major international magazines in French, will be tackled in the years just ahead by the Interministerial Mission on Scientific and Technical Information (MIDIST). Training specilized scientific interpreters, developing research into computerized translation, availability in French of all world scientific information -- it is nothing less than a mobilization program that we should be well advised to put into effect to insure that the French language will endure, particularly in the domain where it is in mortal danger.

Conference Followup

M Chevenement informed the conference that the bill had not been drafted as yet, but that it will be ready within the next few weeks, with the help of the rapporteurs who prepared the various conference summaries.

Predicting that decrees, regulations, and decisions of all kinds at every level would inevitably follow, M Chevenement said that he sees it as "essential" as followup to the conference to set up an organization which would continue and support dialogue and concerted action among those involved, at the regional level, in government agencies, and in the nation's corporations.

The ministry for research and technology, he added, would encourage the formation of regional assiciations to bring together everybody who has worked on organizing committees, the regions, and national corporations with a system of individual or group dues which would ensure some degree of autonomy and cover the cost of staff.. (particularly young people). A national association supported by CESTA, now on the drawing-boards, could provide a clearinghouse for these regional associations.

The regional organizations could encourage formation of technology promotion clubs in the regions, using the schools, technical centers, and National Science Research Center (CNRS) or university laboratories, as well as those in state-owned corporations.

These regional associations would be called upon to organize "regional councils," or to set up working groups to formulate plans and proposals.

At the regional level, involving large agencies and national corporations, I suggest preparation of precise and specific proposals which would then be summed up very succinctly on a single sheet of paper, using a model which could be designed very quickly.

National review and followup will then be organized, with indication of the various levels at which final decisions could be made.

The change must become swiftly and increasingly evident without wasting time but without precipitate haste. A year from now, we shall be looking over the record.

By starting this movement, we have challenged ourselves to change, It is for us, all of us, to pick up that challenge, M Chevenement concluded.

M Mauroy's Remarks to the Closing Session

As he closed the conference that had been opened by the president, Prime Minister Pierre Mauroy followed the President's lead in underscoring "the economic and social stake riding on research, which is one of the main responses to the crisis we are going through."

M Mauroy also laid some stress on the importance of nationalizations in this context; they will, he said "enable us to accentuate the spread of research and of new technologies."

"The great industrial conglomerates in the public sector will make an essential contribution to the national research effort. First of all by reason of their size, for these companies conduct about half of all industrial research, and because achievement of our goal of expanding a national research effort, in relation to the GIP, is intimately tied in with the growth of their own research effort. By transferring the research [lines missing] to industry, these great public agencies, thanks to close and diversified efforts at cooperation, exchange of research staff and of techniques for dissemination of results, and by a re-examination of the whole issue of sub-contracting."

Small and medium businesses will continue to play an essential role, the prime minister pledged, and added that "instead of crushing them, as they do all too often these days, the public corporations must pull them along in their wake. A very large corporation cannot in fact even begin to make everything its design offices come up with.

It would therefore be a good thing if research people employed by the national corporations were encouraged to set up small innovative private enterprises of their own.

"Not everyone who goes into research ought necessarily to make it his life's work. We must expect and plan for career changes. And spending some time in industry looks to me like one of the most promising routes to successful change."

Citing the various measures the government has already taken to help finance industrial research and innovation, such as increasing appropriations for the National Research Support Agency (ANVAR), the pending availability of stock in the Innovation-Development Company (INODEV), the granting of loans at very low interest, etc..., the prime minister argued that all this would be insufficient if the banking system as a whole were not mobilized behind these goals. Nationalization of credit, said the prime minister, "should enable us to implement a far more voluntarist policy, which I am asking the research and development minister and the economy and finance minister to get to work on right away."

"Other action," added M Mauroy, "will be taken. As of 18 January, for example, I should receive the report on the Center for Advanced Systems and Technologies Studies, whose mission will be to serve business and industry, but also to assist in training professionals or labor union officials."

In conclusion, emphasizing that he was talking to the researchers "as citizens," the prime minister said: "The nation is preparing to make a considerable effort on behalf of research. In so doing, the community formally recognizes the value of your function in society. This commitment implies, on your part, a reciprocal commitment. You cannot simply back away from your responsibility to make your work worth more, economically, socially, and culturally. Were you to do so, you would simply be turning a deaf ear to a nation that has confidence in you and expects great things of you.

"I am well aware that the idea of 'social demand' of which I am speaking right now has been mentioned a great deal at this conference. It is true that it is not an easy concept to define. Yet it does express a reality. I am asking you not to dash those expectations. I am asking you to help see to it that, at long last, the world of research and the society as a whole can speak freely with one another."

General Report from M Lazar

An "exemplary brew of men and ideas," an "undertaking without precedent in the history of science and technology" were some of the epithets used by Philippe Lazar, who presented the final report at the closing session of the national conference on research and technology.

While "some time will have to pass before all the profound and lasting consequences of this gathering are revealed, all indications give ground for hope that we shall not stay long at the talking stage... These are the political stakes, as of today," said Mr Lazar, before discussing the results and the spirit of the conference's labors.

1. Organization. "The prevailing vocabulary has itself changed. The old habit of drifting with the current has vanished into well-deserved oblivion, and all agree in discovering new virtues in operational democracy." But we must, beginning now, "bring the democratic debate to its conclusion, and that conclusion can only be a body of choices, once the various arguments have been heard and the conflicts, insofar as possible, resolved," added M Lazar, referring to the process as a "calm revolution."

2. Dialogue: the conference, which allowed "mutual discovery by groups which, hitherto, knew nothing of each other or, at the very least, seldom got together," should have as its first effect, "the establishment of new ties which the creation of regional or local associations for research and technological development should encourage and confirm." These associations should play "an essential role in the quantum leap of scientific and technical information."

3. Exchanges: Mr Lazar emphasized in this connection "the unanimous and urgent demand" for "removing the barriers that too often hamper the free circulation of men and ideas between the world of production and that of research," this shortfall in exchanges being attributable "first to the multiplicity and rigidity of regulations," but also to the "divergencies and compartmentalization that creep in gradually throughout the training process," all of it leading to "early casting of careers in concrete."

Regulatory changes must provide for and encourage "interprofessional fluidity" ("assured return to the job," procedures for temporary exchange of personnel). While there is no question of challenging the existence of creative functions (scientific and technical functions) of management and transfer (administration, exploitation, information) or of training, "no imperative other than structural and hierarchical rigidity implies that these functions must be performed on a permanent basis by the same men throughout their careers."

4. Regulations: "Standardization of regulations among public agencies for research and higher education" is important in this connection. "Applied without proper precautions, the civil service regulations -- as they stand -- would involve constraints incompatible with the proper functioning of research." However, "the dignity of the research worker's social function" must be recognized, and that implies "legitimate guarantees for his career and his social protection."

5. Evaluation: We must "seek out procedures which minimize the risk of indefinite continuation of activities of limited interest." In this context, it is well, before making any suggestions for improving the

present situation, to emphasize "the quality and the uniqueness of the evaluation system upon which certain public research agencies operate, which have institutionalized judgment by statutory scientific comissions which include heavy elected representation for personnel." However, within these evaluation bodies, "representation for technical and administrative engineers is manifestly inadequate," said M Lazar, who also underscored "the absence of balanced representation of researchers on university evaluation panels." To the rapporteur, "the current procedures for election and appointment of their members too often leads to the emergence of a mandarin ruling clique," while "majority impact has a tendency to slow or even interdict the growth" of marginal disciplines and of the as yet "undisciplined" sciences.

In short, we must scrap "evaluation-as-sanction," and seek more "to guide than to crush."

6. The Future: All those involved in the conference were stuck by "the extraordinary proliferation in this country of structures for research or innovation and by the extreme diversity and richness of the work in which they are engaged. (...) The whole idea is to find out how best to organize the conditions under which this potential operates and grows," which in itself involves "incontestable talents for self-organization." In M Lazar's view, "Above and beyond vigorous statement of the principle (of freedom), no doubt we shall have to concern ourselves more from now on with procedures that can guarantee everyone the right to manage his own activities within the context of planning flexible enough to allow him to do so, but at the same time rigid enough to guarantee to others the power to exercise similar rights with the necessary means."

After voicing the need for more research on peace and international exchanges, particularly with the Third World, M Lazar concluded with the thought that "the foundations for a real contract -- a moral as well as a material contract -- between the nation and its researchers and technicians runs beneath an "overriding demand for democracy." that implies "respect for diversity and for the free communication of ideas and of men," a "radical change in power relationships in all our structures," and the transition "to a higher phase of the exercise of responsabilities."

The Academy of Sciences Hopes for Continuation
of the Advisory Committee on Scientific and
Technical Research (CCRST) and of the General Delegation
for Scientific and Technical Research (DGRST)

In its written contribution of some 40 pages to the national conference on research and technology, the Academy of Science voices its hopes for the retention of the CCRST and the DGRST.

"The role of bodies of this kind is a very important one, and it must be filled," says the Academy, which goes on to define the role they have in fact played since their establishment in these terms:

"The advisory committee on scientific and technical research (CCRST) has been active for 23 years. Its value is recognized. Its horizontal structure cuts across those of the user ministries and research agencies that follow the vertical mode, and this enables it to act clear-sightedly in coordinating research. Experience has consistently demonstrated that the 16 members of this committee are people with unchallenged stature, attentive, hard-working, who agree to survey the entire field of scientific and technical research for a period of years with great breadth of vision, and they are free enough to state independent opinions.

"The general delegation for scientific and technical research (DGRST) which, with its facilities for study, inquiry, and evaluation, lives in perfect symbiosis with the CCRST, conducts a continuous analysis of the status of interaction or lack thereof within the system in which basic research, applied research, and research and development are all intricately involved.

"It is thus in a position to single out the promising sectors which must be given vigorous aid, and the areas currently in a weak state, but which are sorely needed in the community, and which must be helped. The DGRST reports on these, and spells out the options in detail. In addition, the DGRST has the means to provide incentives whose role is vital: concerted action, interdisciplinary action, and joint university/industry action.

"The DGRST is a lucky French invention, and it behooves us to hold fast to it, in its present form or another."

Labor Union and Political Comment

Some 200 representatives of labor and employer organizations took part in the conference, while only spokesmen for the political parties in the government majority responded to the invitation to attent.

Messers Alain Devaquet (RPR) and Michel Pinton (UDF) did not take the floor during the plenary sessions, which were reserved for reports from the commissions and for remarks from labor, management and political sources.

All speakers commented favorably on the sessions of the conference, thanks to which, said M Guy Hermier (PCF) "Scientific policy becomes the whole nation's business," but there was a discordant note from the CFDT: its spokesman, M Michel Rolant, criticized "the hasty short-cuts that marred its preparation," as well as the way the procedings were "dominated by research professionals."

Several speakers raised the issue of financial ways and means: one was M Lionel Jospin. The first secretary of the PS warned that the necessary increase in appropriations must not "lead to excessive influence from the state, even though it is a state we have reformed." That remark brought enthusiastic applause from the audience.

Most participants emphasized the bond between science and technology and the needs of the economy. In the view of M Rene Le Guen (CGT), all scientific progress must encourage "a new logic in development," spurning "the discriminatory and stifling choices of research fortresses that promise a quick return on investments."

The spokesman for the National Council of French Employers (CNPF), M Georges Boudeville, called for some easing of the value-added tax for corporations on the basis of "the rise in annual costs of research and development."

From the other side, Mme Huguette Bouchardeau (PSU), like M Rolant before her, protested against the "illusion that technological innovation can become the foundation of a recovery policy." M Hermier ventured the idea that science and technology alone are not enough to get us our of the recession."

Communication between the research community and laymen was taken up by two speakers: M Henry Bordes-Pages (CGC) rejected the notion that "science is a preserve set aside for the experts," while M Robert Cottave (FO) called for "opening up research to the French people (by) creation of a fourth TV network devoted solely to social, economic, technical, and scientific information."

Satisfaction for the demands of research personnel, particularly with regard to career status, was demanded by all union spokesmen, while the representative of the National Union of French Students (UNEF), formerly known as Renouveau, deplored the "precarious lot of students just completing their undergraduate work."

Lastly, M Alain Mouchoux, of the National Education Federation (FEN), complained about the paucity of funds for pedagogical research, which "amounts to only one 300th of the national education budget." The spokesman for the national federation of farm operators' unions (FNSEA) protested at the inadequacy of agronomic research, "considering the importance of agriculture."

National Open-Door Day for Laboratories

The Open Door days held in almost 1,000 laboratores and research centers on 16 January met with enthusiastic response from people all over France.

The scientific and industrial community mobilized en masse, as an adjunct to the national conference on research and technology, to show the potential of French research. Scholars in serried ranks in the morning, and families or science buffs in the afternoon, swarmed into most of the most prestigious public, university, private, and industrial research centers in France.

They were welcomed by research and technical staffers who, sometimes with the aid of films, patiently tried to explain the secrets of the atom, of the galaxy, of immunology, or even the automated subway system.

It was the big centers -- particularly the nuclear study centers (Saclay and Cadarache), the national center for scientific research (CNRS), the Pasteur Institute in Paris, the national space studies center at Toulouse, the observatories (meudon, Haute-Provence), and universities like the Polytechnic or the agronomic research centers -- that attracted the biggest gates.

At the national space study center in Toulouse, close to 3,000 visitors eyed the pot and Marecs satellites, the infrarouge remote detectors, and the exhibit of the Argos and Sargos balloon systems.

In Provence, 50 laboratories opened their doors, among them the Cadarache nuclear studies center and the Haute-Provence observatory. In Lille, the University of Sciences and Technologies offered an example of collaboration between the university and industry, under whose joint aegis the research workers had devised and developed a totally automated system for operating the subway. At the center, visitors were particularly fascinated with the Nancay (Cher) radioastronomy station, and the laboratories at the Orleans office for geological and mineral research (BRGM), as well as with the national institutes for agronomic research (INRA).

Further west, the University of Rennes showed the public its collection of ores and offered lectures on continental drift or European agricultural policy. In the Paris area, at Saclay, several dozen engineers were on hand to show the public around the Osiris and Orphee reactors.

Just about everywhere in France -- except in the Bordeaux a and Strasbourg areas, where the public tended to stay away -- visitors commented on the helpfulness of this "Open Door" operation, and expressed the hope that "it would happen more often."

INRA's Contribution to the National Conference

The National Agronomic Research Institute (INRA) took part in all the regional conferences preliminary to the national conference. For the latter, seven of the Institute's specialty topics were chosen by the general directorate, after discussion with the members of the scientific committee and of the board of department heads and administrators:

-- aims and orientation in agronomic research and new models for economic and social development;

-- the "chain of knowledge" in agriculture: research, higher education, professional training, development, and getting the word out;

-- putting the findings of research in agriculture and in the agribusiness to good use;

-- quality and consumer problems (environment, life surroundings, quality of food products);

-- adapting the INRA to its national and regional missions -- internal structure of the plant -- problems posed by the existing infrastructure (diversity of situations, heritage of the past, demands of the future;

-- INRA's place in the national, European, and international science community -- optimizing synergistic effects;

-- agronomic research and international technical cooperation, with special emphasis on the developing countries.

ORSTOM and GERDAT OPERATIONS

The Office for Overseas Scientific and Technical Research (ORSTOM) offered an audiovisual series from 13 to 19 January on its activities in the area of health, as part of the exposition mounted in Paris at Radio House to coincide with the national conference.

Behind this presentation by ORSTOM, a public agency that cooperates with 25 countries, was a desire to inform the public of the gravity of endemic diseases, both at the health level and in its impact on economies. ORSTOM chose onchocerosis (river-blindness) as an example. Onchocerosis is the number-two cause of blindness worldwide, a disease that affects 20 million people and hampers economic development in the countries of West Africa, which are already among the poorest in the world.

In Upper Volta, ORSTOM, in collaboration with WHO, has developed a program for stamping out the disease -- a task that will take 15 years -- by destroying the larvae of the fly which is the vector of the disease. This action involves helicopter spraying of larvicides weekly on the surfaces of all rivers and streams, combined with medical monitoring of the populations.

At the same stand in the exposition, the Study and Research Group for the Development of Tropical Agronomy (GERDAT), which coordinates the work of eight tropical agronomy applied research agencies, displayed two laboratory devices: a coffe-pulp fermentation vat which produces methane, and a cracking distillation oven that turns vegetable oils into fuel for internal combustion engines.

6182

CSO: 3102 /147

FAILURE OF MDF-100 PROJECT, FOKKER'S PLANS NOW

Amsterdam ELSEVIERS MAGAZINE in Dutch 13 Feb 82 pp 142-145

[Article by W. A. Verwoerd and J. Heinemans]

> [Text] Within 1 hour, the contract between Fokker and McDonnell Douglas was broken. "Actually, we were all of us quite relieved," Frans Swarttouw says. "The decision to start the project together was a heavy one, the decision to stop it straight away was at least equally difficult. Actually, we could have continued it but, then, at the risk of putting 500,000 guilder or more into the project while not being certain at all whether it would be a success."

Sunday afternoon at 2 p.m., in his room in one of the Fokker buildings. Frans Swarttouw has just returned from the United States. "For the first time in my life, I have slept for 14 hours in a row." He does seem somewhat tired. Nine months ago, the sky still seemed the limit for Fokker. The cooperation on which Fokker and McDonnell Douglas had decided in May of 1981 was a logical consequence of the cut-throat competition in the replacement market for passenger aircraft.

Frans Swarttouw had earlier been to Seattle, where he had approached the giant Boeing. However, he was told there: "You may work together with us, but only on our conditions." It could not have been more honest. "But we did not feel like that. We were then able to make the deal with McDonnell Douglas. It is true that this was not the strongest partner of all, we knew that they were left practically stranded with their DC10 project and that the successful DC9 program was coming to an end, but we had now at least a possibility of developing a third position next to Boeing and Airbus. Time was running short, we were already late."

In the course of the coming years, costly, noisy aircraft consuming much energy, such as the DC8 and DC9 and the Boeing 727 and 707 will rapidly be discarded. There is thus a new market, and, in that market, Fokker and McDonnell Douglas would start competing with two formidable competitors. For short and medium-range distances, Boeing is busy with the extended 737 and with the 757 and 767, which already now seem to becoming a success, and for which Boeing has already received well over three hundred definitive orders and of which the first 757 aircraft will be delivered at the end of this year.

Airbus has obtained a firm footing in the world and especially in Europe with its A310 and A300. Of the A300's (250 seats), more than 150 aircraft have already been delivered, of the A310's (200 seats), 178 orders are on hand. Companies such as Lufthansa, Air France, KLM and Swissair, SAS and Alitalia found the Airbus the ideal medium-range distance aircraft, which will thus form the nucleus of their new fleets. At the moment, four Airbus aircraft are being built per month, and by 1984, the number will already have risen to eight per month.

Was the gap in the market then quite as big as felt by Fokker and MDD about 1 year ago? Not only because the competitors were already busy, and Fokker-MDD actually still had to start, but there were other threatening disappointments. Manufacturers of jet liners are not prospering at the moment. Also they are being hit irrevocably by the world-wide recession. Although the big international airline companies have developed plans to drastically modernize their worn-out fleets in the eighties, these plans remain in cold storage longer than was originally foreseen. Due to a decline in the demand for transportation, on the one hand, and to sharply increased costs, on the other hand, international airline companies suffered a total loss in 1981 of nearly 3 billion guilder.

Such difficulties are not exactly a stimulation for managements to invest huge amounts in new aircraft. However, in the long run, the companies have no choice. There is an urgent need for much more efficient aircraft than the ones now in the air, and which, as far as fuel consumption and staffing are concerned, have become outdated. The manufacturers thus assume that, in the course of the next decade, new aircraft worth well over 300 guilder will have to be ordered. According to Boeing, there is, undoubtedly, space in the air for 3,500 to 4,000 new jet liners.

The stagnant development in air traffic has, however, already caused a few dramatic changes in the plans of manufacturers. Lockheed, for example, decided to stop its production of Tristar L-1011 by 1984. The program already last year caused Lockheed a loss of nearly 200 million guilder. Also McDonnell Douglas was hard hit: the already stagnating DC10 program was given a severe setback after options were abandoned and new orders failed to come in. Thanks to an order from the Pentagon, it was possible to maintain production of the DC10's for still some time, but, everywhere in the world, DC10 aircraft are, at the moment, for sale or for rent, often at ridiculously low prices. After the bankruptcy of Laker, a total of 57 DC10's are standing unused on the ground.

The fact that MDD was able, in 1981, to increase its profits by 20 percent to well over 175 million dollars (400 million guilder) was solely due to the production of non-civilian aircraft. In the civilian sector, MDD last year lost 85 million dollars, amply 200 million guilder. No wonder that the rumors toward the end of 1981 became increasingly stronger that MDD before too long would withdraw from the civilian sector, that it would, at the most, be concentrating on the extended DC9, the Super 80.

However, these rumors were not decisive in making the decision to cancel the contract between MCDonnell-Douglas and Fokker. There were other grave difficulties. "When designing the MDF100, we assumed that the fuel costs would shortly increase to 1.5 dollars per gallon (4.5 liters). But as a result of the economic recession, oil producers have had to adjust their prices to the changed market conditions, so that the kerosene price is now 1 dollar per gallon. Gone was the advantage of the

economical MDF engine. A second factor, which we were unable to foresee, was the strike of traffic controllers in the United States and the subsequent dismissal of 12,000 employees."

The U.S. companies immediately took action: routes were discontinued, other routes were either flown less regularly or bigger--completely fully booked--aircraft were dispatched. The small demand--also a consequence of the recession in the United States--has had the effect that proposed investments of U.S. domestic airline companies were postponed indefinitely. And on these very companies, especially Delta, MDD and Fokker had primarily set their hopes for their new 150-seaters.

A third and perhaps decisive factor is the lack at present of a suitable engine. For engine manufacturers are also somewhat reluctant, dare not quite well, for the development of a new engine costs a fortune--approximately as much as the development of an entirely new type of aircraft. For a suitable engine, three candidates were, in principle, in the market: the Rolls Royce/Japanese RJ-500, a new version of the French-American (Snecma-General Electric) CFM-56, and an engine based on the Pratt and Whitney PW-2037 engine, the PW-STF-633. All of these sources of power have to have a propelling power of approximately 25,000 lbs.

Fokker, what now? Swarttouw: "All kinds of things are happening with us. A new situation has arisen, that is for sure, in which we shall have to focus all of our attention on the existing F27 and F28 projects, at the same time as we shall have to continue our studies on new advanced aircraft. The present form of the F28 does not allow for any flexibility. We cannot, for example, just extend the aircraft, then we would have to develop an entirely new wing. But there is still plenty of interest in the F28. When I came here 3 years ago, ten F27's and just as many F28's were being built per year, while there were still a couple of unsold ones. Now we make 24 Friendships with different specifications and 18 Fellowships per year, and we have got orders on hand for 18 months."

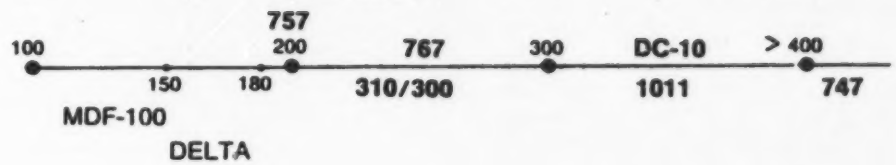
"What have we achieved in addition? We have canceled an entirely unsuccessful merger with VFW, and we have cut the ties with MDD, so that we can now concentrate our attention on our own existing projects. We believe that we shall be able to usher the F28 into the nineties, and that is something quite different from what I heard when I first came here and they said: 'The F28 is virtually finished.' We are slowly becoming the only ones in this section of the market. Abroad, the construction of this type of aircraft--and ideal feeder liner--is hardly being considered anymore."

"The F27 Friendship is in need of modification. We have a large staff on hand to modernize it. We still do not know whether minor or major changes will be involved. The research is still going on, but the least change that must take place is that the F27 be equipped with a better engine, and, then, it will be quite possible, for example, to extend the aircraft. But also here there are engine problems, for a suitable prop fan (propeller engine with jet propulsion) is not yet past the development stage, perhaps we may not expect this to happen until the early nineties."

"We keep our doors open, keep looking beyond our borders, for example to Japan, and we would not mind to enter into new projects with foreign manufacturers on a modest scale, for example on a 30-70 basis. But we are certainly in no hurry in that respect. I am no advocate of mergers," says Swarttouw. "Enterprises of

completely different cultures are extremely difficult to combine. We have, for example, a man sitting in Japan who is now explaining the situation which has arisen. For we want, after all, to make sure that the relations which were developed at an earlier stage are not cut off definitively."

"We also remain in negotiations with MDD. It is true that MDD already has said that the development of an aircraft for more than 150 passengers will be continued there, and that the possibility of cooperation with potential partners (other than Fokker) will be further looked into." Swarttouw considers it nonsense to talk about leakages of know-how. "Of course, we have been looking into each other's kitchens, it has been a clearly two-way traffic. But it is greatly exaggerated simply to say that McDonnell Douglas would have learned everything from Fokker. They know in Long Beach just as much about aircraft as we do, perhaps even more."



In the above illustration, Frans Swarttouw shows where the MDF-100 plans were finally abandoned. There is a new market for aircraft for between 100 and 400 passengers. From 200 seats and upwards, the market is more or less equally divided. The MDF-100 project aimed at about 150 passengers, but Delta, the most important potential customer for MDF 100's, wanted more, approximately 160 seats, and was in this supported by McDonnell Douglas. Fokker feared, however, that a too large MDF 100 would have to contend with the Boeing 757, a formidable competitor already in production. When McDonnell Douglas kept putting off the final talks on the extent of the aircraft, Swarttouw got strong feelings that McDonnell Douglas did not want any competing aircraft for their own Super 80, which was selling well.

ORDERS LARGE COMMERCIAL AIRCRAFT

PRODUCER	1981 NEW ORDERS TYPE	NUMBER	TOTAL ORDERS THROUGH 1981	TOTAL DELIVERED
Airbus Industry	A-300	26	324	158
	A-310	19	178	0
	A-320	50*	50	0
Boeing	727	24	1,824	1,784
	737	129	990	730
	747	22	586	536
	757	24	136	0
	767	7	173	0
British Aerospace	146	25	25	0
Fokker	F-28	21	191	174
Lockheed	L-1011	5	241	217
McDonnell Douglas	DC-10	20	409	362
	DC-9	28	1,112	1,025

*Air France order: 25 definitive and 25 options

7262
CSO: 3102/154

BAE 146 CONTINUES SUCCESSFUL TEST FLIGHTS

Gelsenkirchen AEROKURIER in German Jan 82 p 8

[Text]

The prototype of the BAe 146 Feederliner already has had 100 hours of flight testing. The BAe 146, which in addition is the first British civil aircraft project in 18 years, is designed in its 100 version to transport 109 passengers--mainly over short stretches. At present there have already been 13 definite orders and 12 options. First deliveries are planned for the end of this year. As moreover reported by British Aerospace, the second prototype of the BAe 146 will shortly make its first flight.

8008
CSO: 3102/150

AIRBUS: FUTURE PRODUCTION, MARKETING STRATEGY OUTLINED

Gelsenkirchen AEROKURIER in German Jan 82 pp 17-24

[Article by R. Doerpinghaus: "Europe's Big Opportunity: Airbus A320 Confronting Decision"]

> [Text] Headlines from Toulouse: Shortly before the end of the year Airbus Industry passed the "magic mark" of more than 500 aircraft sold. The airbus A300/A310 is thus after the Boeing 747 the second long-range aircraft to have been ordered in a quantity exceeding half a thousand. To be exact, on 8 December there were 507 orders and confirmed letters of intent to purchase for the A300/A310. Thus the airbus order bookings already extend up to April 1986. Altogether 44 airlines have decided in favor of the airbus. What is more, in 1981 the airbus A300/A310 quite clearly emerged from the race for the long-range aircraft market as the victor in its class. With a total of 45 units sold Airbus Industry was sure of a 54-percent share of the market. With its models 747 and 767 Boeing received a total of 26 percent of the long-range jet market in 15 sales of the former and 7 sales of the latter. In the year 1981 so critical for air transport Lockheed with eight sales of the L-1011 TriStar and McDonnell-Douglas with eight sales of the DC-10 could command only 10 percent of the market.

Worldwide at the end of 1981 about 160 airbuses were already in use. But not only in sales but also technologically Airbus Industry aimed at making headlines at the end of the year: At the beginning of January the first airbus with a two-man cockpit is being delivered, after grant of the basic licensing [Musterzulassung], to the Indonesian airline "Garuda." The Garuda cockpit is a first stage of the FFCC cockpit which in the future will be provided as the standard for the A300/A310. The Garuda cockpit differs from the FFCC primarily in the absence of image-screen instruments. But it is otherwise largely the same as the FFCC cockpit and already possesses a large portion of the operating and system simplification. But also at the end of the year the first A310 was just about to be completed. While a formal rollout was dispensed with, nevertheless it certainly would have been worthwhile to present the A310 to the public with somewhat more fanfare. Such ceremonies are admittedly not necessary but in the interest of public relations (and Airbus Industry still has need of these) should not be

neglected. It is also necessary for the future of Airbus Industry that the public in the partner nations should identify with this aircraft program and to this end it is not only sales figures but also a little psychology which is requisite.

But also at the end of the year the A320 program for a basically new 150-passenger transport aircraft has entered into a decisive phase. After Air France already in May of last year had been the first airline to order 50 airplanes the project definition was further refined and sharp-tuned in negotiations with other airlines, especially the American Delta Airlines. The two originally planned airframe variants were in this process amalgamated into one basic version which, however, is being offered with different tank capacities and maximum takeoff masses. At the same time at the end of the year there was a lot of agitation about the possible power plants of the A320 for which now favor is probably being given to a further developed CFM56 version based upon the currently available power plant technology. The advantage: if the A320 were introduced in the year 1986 the power plant would already have been best tested by being used in the modified DC-8, 707 and KC-135.

If Delta Airlines should decide for the A320 then finally all signals would probably be "go" for the Baby Airbus. The decision is expected to be this spring.

But at the end of the year the airbus program should also be viewed under its national economic aspect. After Airbus Industry in October was designated by the French Government as the greatest exporteur (German fraction MBB/VFW 37.9 percent) and with the unemployment figures in all partner countries reaching new record marks this winter it is especially pleasing to be able to assert that the construction of large civilian aircraft is also being reckoned over the long term as a growth industry. Until the end of the millenium there is expected an average annual passenger growth in air transport of more than 6 percent. In addition, there is the fact that in the next 10 years one must expect replacement of at least half of the present airline fleet.

If in addition one takes into account that industrial nations dependent upon export such as the FRG have lost their lead in many areas then one sees more clearly the importance of civilian aircraft construction for the maintenance of highly trained job slots in the eighties and nineties. At the same time, however, one may not rely just on the success up to now of the A300/A310 but even today one must initiate two programs in order to secure a certain continuity.

People have already become almost accustomed to the reports of success from Toulouse: More than 500 airbuses of the type A300/A310 have already been sold and the fleet plans of the airlines which have already ordered the airbus lead one to expect further substantial orders in the future. And it is already a fact that the airbus has restored to European aircraft builders a good part of the self-confidence which not very long ago they appeared to have lost. Today it can be said not without pride that the airbus is after the Boeing 747 the most sold long-range aircraft in the world. And more besides: The airbus program ranges far beyond the turn of the millenium into the future and thus assures thousands of highly trained job slots in all partner countries. An essential contribution to the success of the airbus was the recognition that one cannot sell aircraft

which are identical down to the very last rivet but that in an aircraft program of this magnitude one must be flexible from the outset in order to be able to adapt oneself to the needs of the different airlines throughout the world. In other words: it was of essential importance for the success of the airbus that its early development was in the direction of a family. And today even this family has become already highly ramified. In the meanwhile there have been so many subversions that no one airbus is like another but each airline is in a position to select from the available palette of offerings the model which best fits its conceptions and its operating conditions.

The development of the airbus program has not only largely restored to the Europeans their self-confidence in aircraft construction but it has also taught the Europeans again that in aircraft construction one must think in terms of eras of time and not let oneself be irritated by short-term ups and downs of passenger statistics and airline profits. For aircraft builders and for the strategists of the fleets of the great airlines this is by no means a new insight. What is new is the fact that the European aircraft builders have succeeded in establishing a consciousness of this among the participating governments and have thus succeeded in creating a reliable basis for building Airbus Industry.

Now one must not allow oneself to be blinded by the present success of the airbus. This success can persist only as long as it is worked upon continuously and solidly. Technical development in the construction of large-scale aircraft moves ahead so rapidly that a permanent system of program innovation is required if success is to be lasting.

But the industrial capacity which has been formed with Airbus Industry in Europe at the same time compels one to look beyond the present outlines of the program and to search the market for new possibilities and demands.

In view of the long program advance times which are absolutely necessary today in large-scale aircraft construction market research for a new transport plane becomes extraordinarily difficult. Such market analysis can only be based upon air transport prognoses for the time period in which the to-be-developed airplane shall be used. In other words: the airlines must tell the airplane builders today what airplane they will need in 8 or 10 years.

However, a glance at oil price developments in the last 10 years shows the extent to which the times change and how little they adhere to the most careful prognoses. No one, for example, at the end of the sixties could predict the fuel costs which airlines are having to struggle with today and predict the role which fuel costs would play in planning airline fleets. It is against this background that one must also view the further product planning of Airbus Industry. Today it is not the manufacturer of a transport airplane who decides what type of aircraft he will build but rather this decision is finally made by his customers.

Against this background Airbus Industry has defined the further industrial goals:

First priority is given to the development of a market position which is as strong as possible on the basis of the present models A300 and A310.

At the same time it is also necessary to exploit the progressive technology developed within the context of the airbus program and also the advantages arising from international cooperation within the framework of Airbus Industry. This--according to Airbus Industry--should take place in three ways:

a. continuous improvement of the existing range of products,

b. development of new models and procedures,

c. entrance into new market areas which have thus far been untouched by the A300 and A310.

With regard to the development of new models there are substantially two possibilities:

a. the development of a short-range to medium-range jet for 150 passengers. Here one is dealing with an airplane which must be more or less completely developed from the bottom up in which, however, it must be possible to make the most extensive use of the technology currently available in Airbus Industry and in development;

b. the development of an approximately 230-passenger long-range version on the basis of the present A300/A310 with 4 engines.

It is thus the long-term goal of Airbus Industry, like the Boeing model palette, to offer a suitable model in each of the current aircraft categories.

Since after the exit of Lockheed from the marketplace of firms offering transport planes there remain with Boeing, McDonnell-Douglas and Airbus Industry only three manufacturers it is considered in Toulouse that a market share of at least 30 percent would be realistic.

The Big Opportunity: A320

Of all the market segments investigated at the present time by Airbus Industry the A320 has crystallized out as probably the most interesting project. And in fact the international airlines seem to be crying for a 150-seater in new technology.

Airbus Industry estimates the presently recognizable market potential for 150-seaters worldwide at about 3,135 aircraft up to the year 2000. This estimate is based upon an evaluation of the internal transport plans and prognoses of a total of 189 air transport companies throughout the world including 38 North American, 56 European, 29 South American, 20 African and 31 Far Eastern air transport companies. On the basis of the same investigation Airbus Industry reckons that about 565 aircraft out of this demand package can be met by existing models or by direct developments of currently existing models. The majority of these 565 sales would involve the models DC-9 Super 80, Boeing 737-300 and Boeing 757-200. The remaining open market potential for a new airplane would accordingly run to 2,600 units. This does not include potential purchases by smaller airlines, charter airlines, governments and military agencies. As a projected development

goal, according to data from Airbus Industry, the A320 in comparison with today's Boeing 727-200 should consume 46 percent less fuel and permit operating cost reductions between 23 and 27 percent. Airbus Industry wants to make these more-than-ambitious goals possible on the basis of a to-be-newly-developed aircraft in the realization of which all existing design terms of reference will be disregarded and all available new ideas and technologies can be built in and planned in advance. The development of the A320 took place essentially during 1980 and the first part of '81.

On the occasion of the Paris Aerosalon 1981 Air France as the foremost airline of the world announced its decision in favor of the A320 and ordered no fewer than 50 aircraft at a clip. The industrial risk for the development of an airplane of this category and of this technology is nevertheless so great that the starting contract of a European airline, even one of the size of Air France, does not suffice to completely give the new airplane the green light. Therefore Airbus Industry has made intensive efforts in the past year to win further potential customers for the A320. The most promising candidate was the American Delta Airlines. Up until the end of the year consultations between Airbus Industry and Delta Airlines took a very promising course. In the course of these consultations Airbus Industry declared itself ready to examine* fully the wishes of Delta Airlines and amalgamate the originally planned two basic versions of the A320 in one new model which nevertheless is from the outset to be developed in two versions having different tank capacities. These ideas of Delta Airlines had to be fitted in with the ideas of Air France, the first and thus far only A320 customer; happily this was possible without any serious complications. In the development of the A320 Delta Airlines "slid" more and more into a supporting role. More and more airlines interested in the A320 declared that they wanted to wait out the further negotiations between Airbus Industry and Delta Airlines. In other words if Delta signs the sales contract, which according to rumor would amount to a contract of the order of magnitude of at least 60 airplanes, then additional European and presumably also some American airlines would immediately follow and more or less simultaneously with Delta Airlines order the A320. The special leading role of Delta Airlines may be explained by the splendid operating situation of the latter airline which remained almost untouched by the great crisis which at the time is affecting international air transport.

Up until the end of the year it was possible to say that the negotiations between Airbus Industry and Delta Airlines were running exactly according to program. However, the power plant question turned out more and more to be the central point of the negotiations. An airplane having the performance guaranteed by Airbus Industry is not realizable without new power plants. However, the big all-decisive question is whether these dream power plants will or will not be available in time for the potential introduction of the A320 in line service in the middle of the eighties? And as things appear now the chance that at least one of these "superpower plants" will be available right now seems extremely questionable. Just the development costs of a high-performance power plant of the technology class required by Airbus Industry is estimated on the basis of 1981 prices at about $2 billion U.S., assuming the use of already existent technology and components.

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* Or "accede fully to." The German word is ambiguous--translator's note.

Altogether three power plant candidates are available; these, however, involve more or less provisional projects. The primary candidate is certainly a power plant on the CFM56 basis. The CFM56-2000 power plant pushed for a long time by Airbus Industry would probably be realizable only with difficulty because of its expected high development costs. On the other hand, however, the question arises whether in view of recent oil price prognoses, which proceed more on the basis of stable prices rather than upon the basis of soft prices, the costs of a maximum technology power plant aiming at fuel conservation are at all justifiable at the present time?

Instead of this it appears essentially more realistic to develop on the present basis of the CFM56 motor a more cost-favorable variant specially designed to meet the requirements of the A320. Such a power plant would have the advantage that on the one hand it would be rapidly available and that on the other hand upon the introduction of the A320 it would be a fully tested motor that had got over its childhood illnesses. Since time presses and money sources for power plant financing of the order of billions are at the present time not discernible a CFM56 further developed to a modest extent would be a realistic solution from the industrial point of view.

The manufacturer of the CFM power plant is CFM International in which the American General Electric Company and the French Snecma have combined.

A close competitor in the discussion is the British-Japanese power plant RJ500-35. Rolls-Royce, hard hit by termination of the Lockheed TriStar and hence by the reduced production of the RB211 will surely wager everything on one card in order to be able to offer a power plant for the A320.

As a third manufacturer in the FRG Pratt and Whitney is competing with the STF626M power plant for the airbus A320 opportunity. Direct participants in the development of this latter power plant are the German MTU and Fiat in Italy.

Design

The most important step within the context of the A320 program was the specification of a single airframe which depending upon seat arrangement offers room for 150 to 162 passengers. In the A320-100 version the new short- to mid-range airliner would have tanks available only in the wings. In the A320-200 version the aircraft would receive an additional mid-fuselage tank to increase its range--this, of course, would presuppose licensing of a higher takeoff weight. With its full passenger complement the A320-100 should have a range of 1,700 nautical miles (3,150 km). Likewise, fully occupied the A320-200 would have a maximum range of 2,700 nautical miles (5,000 km). According to the present status of the program the A320 could commence its line service with the airlines by the middle of 1986.

The A320 is a "single-aisle" design. Single-aisle (SA) means that the aircraft has available only one center walkway splitting the rows of seats into two groups of three. The structural data for the fuselage are determined by this cabin design. If one looks at a model of the A320 then its similarity with the A300 and the A310 is unmistakable. In Airbus Industry they make no bones of the fact that

all the results of aerodynamic research for the A300 and A310 have had direct application in the design of the A320. At the same time the little airbus designed as a low-wing plane has no particular optically spectacular features in its layout. The power plants are arranged in gondolas beneath the wing and also in the empennage the airbus designers have engaged in no experiments. Nevertheless, the A320 is packed full not only with new but even with the newest technology.

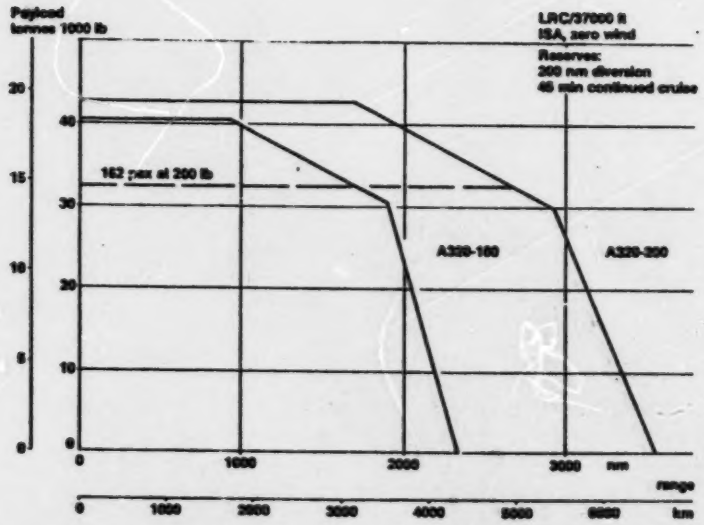
Here one must especially mention the A320 wing which arose directly from development studies for the A310. With a lifting area of 125.8 m^2 and a wing span of 34.48 m the A320 wing has an aspect ratio of 9.5, comparatively very high for a transport plane, with a sweepback of only 25°. Extensive wind tunnel tests were carried out for the aerodynamic definition of the A320 wing. In more than 4,000 wind tunnel testing hours about 50 different A320 variants and 33 further models were investigated. The result is a comparatively smooth wing with a simple flap system and as few movable parts as possible. The spoilers and ailerons are manufactured of fiber-bond materials. The same applies to the elevators and rudders, the cabin floors in the airplane, the cabin claddings, the wing-fuselage crossover, the flaps of the forward landing gear as well as parts of the engine cowling.

But above all the A320 will profit by the new cockpit technology developed for the A300 and A310. Thus the A320 will be offered from the outset only with a two-man cockpit. But also in the system domain the greatest possible agreement between the A320 and its two larger sisters will be striven for. Despite the size difference the airline companies should also obtain full benefit of the airbus family advantages in purchasing the A320.

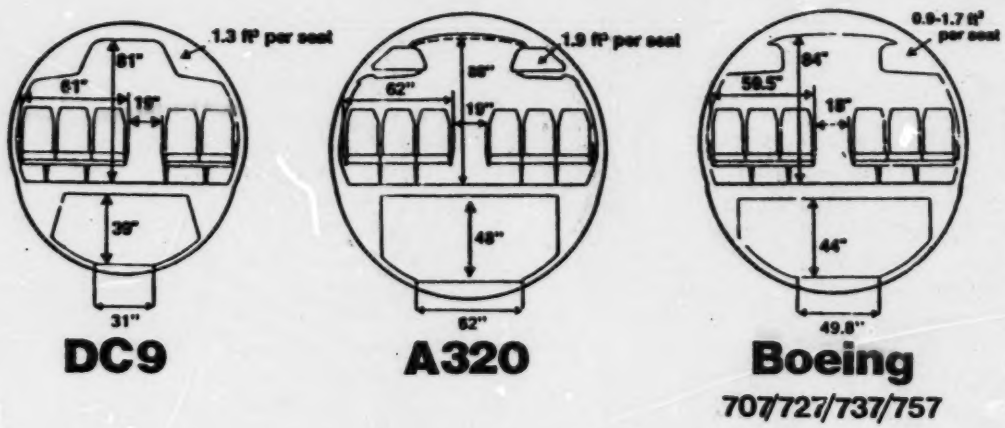
Fuselage Cross Section

Passenger comfort today determines more than ever how an airline company is judged by customers, the passengers. However, in comparison with the "stewardesses' smile" and the on-board service there is one item which is taken with special seriousness by the passengers and that is the space provided in the cabin. Airbus Industry therefore attached special importance to the optimal determination of the fuselage cross section. In so doing it succeeded in producing a geometric miracle in that despite a fuselage cross section almost identical with that of the Boeing 707/727/737/757 there is de facto more shoulder freedom, a slightly broader center aisle and a somewhat higher cabin ceiling available to the passenger. At the same time it was possible to enlarge the floor area in the below-deck freight space as well as increasing the available height in the below-deck compartment by about 10 cm.

In addition, the A320 will have available per seat a substantially more voluminous space for stowing hand luggage. In comparison with the fuselage cross section of the DC-9 the A320 even looks like a small Jumbo although it must be conceded that the DC-9 cabin takes only a maximum of five seats per row. Actually the cabin mockup for the A320 makes a decidedly roomy impression and is full of new detail ideas.



Range-useful load diagram of the A320-100 and -200. Both aircraft versions are almost the same in airframe but differ in tank capacity and maximum takeoff mass.



Comparison of the most important fuselage cross sections (Source: Airbus Industry). All dimension data are given in inches. 1 inch = 2.54 cm.

Opportunities

Wherein now lies the big opportunity for the A320? Why is Airbus Industry so urgent in its position that if this project is to be taken up at all it must be undertaken as soon as possible? The reason is relatively simple: On the one hand there are signs in the market of a great demand for 150-seaters for the two last decades of this century. Apart from the A320 no completely new model is available prior to the A320 from McDonnell-Douglas or from Boeing which aims directly at this size class, assuming maintenance of the schedule dates existing up to now. Boeing, under heavy pressure through the development of 757 and 767 will certainly not begin at the present moment any further fully new aircraft program.

Instead an attempt will be made, for example, with an airplane like the Boeing 737-300 to exhaust market fractions which are as long as possible. A further competitor in the market is, inter alia, the DC-9 Super 80. The advantage of this airplane lies primarily in its fast availability. So it is to be assumed that the Super 80 will still cover a substantial portion of the current market, especially among DC-9 customers.

Thus for the A320 there exists a "historic opportunity." If the aircraft could be fully commenced in the near future then that would imply at the same time that Airbus Industry could assure itself a significant lead in the development of this airplane.

However, a look back at the development of aircraft sales for the individual models shows that the market lead of the airplanes first offered can hardly be overtaken by the second or third planes entering the market without the expenditure of a very special effort.

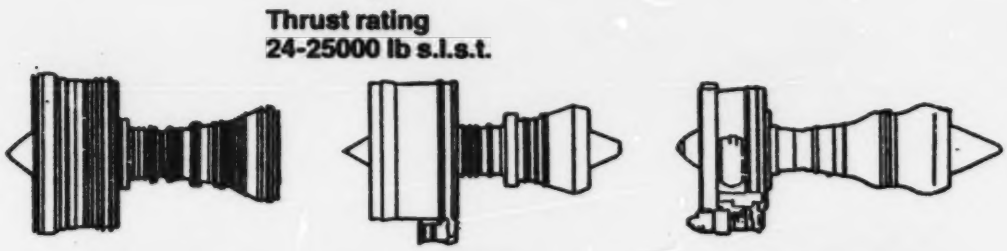
The last decision as to whether the A320 will actually be built depends not least of all upon the attitude of the governments of the participating airbus partner countries. Here, however, one should know that it would probably be cheaper for the realization of such an attractive program to make suitable credits available as needed and in this way guarantee many highly trained job slots rather than having to pay out corresponding sums later on for support of the unemployed. Of all the airbus projects under consideration the A320 appears to be the most attractive project currently both from the point of view of time and also in terms of its design. It is reported that the so hotly anticipated decision by Delta Airlines will probably be made sometime in March if no further delays occur because of problems arising in tailoring the power plant. Thus, it will be possible at the latest to say at the ILA [International Aircraft Exhibit?--Tr.] in Hanover whether Europe has understood how to seize the opportunity presented by the small airbus A320.

With the amalgamation of the two originally planned differently sized A320 versions into a single basic design, which, however, will be offered in two variants having different takeoff weights and tank capacities, Airbus Industry has created in this program an essential prerequisite to cost reduction. In addition to the design simplifications it is necessary de facto for just one more flight test program to be carried out and then the later mass production will also be made easier.

If now efforts were also successful to produce a power plant version for the A320 realizable on an industrial basis without state help largely on the basis of existing engine components and at a relatively low development cost then Airbus Industry would probably be considerably closer to realization of this new airplane even if the dream data with regard to fuel consumption were still not quite attained. This does not exclude the possibility that in the future all advances related to the power plant would flow into the program. But the industrial startup to the point of establishing mass production would, however, be substantially facilitated.

If the A320 program can be carried out as planned then the final specification of the design would probably take place in the coming spring. The first prototype would be assembled in mid-1984. One could figure on the first half of 1985 for the first flight and on model licensing and introduction into line service by the middle of 1986.

Finally, another glance at the potential models competing with the A320: the principal competitor is the Boeing. Here there are four potential competing models under discussion. Here the first to consider would be the Boeing 737-300 which represents an especially attractive offering for those airlines which already have the 737 in service today. With close to 1,000 aircraft of the 737 series sold this model is their best on the market. The same is also true of the 727RE, a twin-jet further development of the current Boeing 727 with modern fan-engines (CFM56) which would combine the advantages of a proven airplane with the economy of modern engines.



The three current engine candidates for the A320 are the CFM56-2000 of General Electric/Snecma, the British-Japanese RJ500-35 of Rolls-Royce and JAEL as well as the STF626M of Pratt and Whitney/MTU/Fiat. The required thrust would be in the order of magnitude ranging from 106 to 110 kN (10,890 to 11,350 HP). The data refer to the program situation in December 1981. However, at the end of the year there were new ideas especially with regard to a more cost favorable CFM56 variant which, however, still cannot meet the very high expectations for reduction of fuel consumption.

A320 Data, Status as of December 1981

Manufacturer	Airbus Industry, Toulouse
Model	A320-100, A320-200
Application	Short to medium range
Engine options	General Electric/Snecma CFM56-2000 or other version on CFM56 basis
	Rolls-Royce/JAEL RJ500-35
	Pratt and Whitney/MTU/Fiat STF 626 M
Thrust class, lbs	24,000 to 25,000
kN	106.6 to 111.1
Cockpit crew	2

Passenger category	150-seater	
Maximum number of seats (typical mixed seat arrangement)	150	
Maximum number of seats (all economy)	162	
Seat arrangement	3+3	
Wing span, m	34.48	
Length, m	34.41	
Height, m	11.78	
Lifting surface, m^2	125.80	
Aspect ratio	9.50	
Sweepback, degrees	25.00	
	A320-100	A320-200
Maximum starting mass, kg	60,000	71,900
Equipment mass, kg	39,248	39,656
Maximum cargo, kg	26,752	32,244
Maximum mass without fuel (MZFW), kg	57,607	59,077
Maximum fuel, kg	12,900	18,800
1	18,170	26,480
Loading example:		
Number of passengers	162	162
Passengers + baggage, kg	14,697	14,697
Freight cargo, kg	3,662	4,724

But there is also competition from the Boeing 757 which it is still not possible to evaluate today. And last but not least there still exists the possibility that Boeing will start a corresponding model in direct competition with the A320 in which Boeing could then also combine all advances of modern aircraft construction in an aircraft design completely new from the ground up.

McDonnell-Douglas has two models in competition with the A320. First there is the DC-9 Super 80, an airplane which is already available today with currently very favorable fuel consumption, meeting environmental standards at a high level and also being modern in its systems. In addition, McDonnell-Douglas is at present developing in cooperation with the Dutch Fokker Works the so-called MDF-100, an airplane design which is also very advanced in which the technological know-how of both entrepreneurs is combined.

Despite this competition the market chances of the A320 should still not be bad since its system homogeneity, right up to the cockpit layout, with the other airbus models should by itself incite many airlines to attain still greater uniformization of their fleets by procuring the A320.

Industrial Alternatives

Despite all positive prognoses and despite the order placed by Air France the possibility is, however, not to be excluded that the A320 program will not take the course desired for lack of an adequate number of orders, for one reason or another. But also for this contingency Airbus Industry is prepared and would with great probability undertake one or more of the currently possible programs for further development of the A300/A310. Here to be considered are the new airbus versions TA9/TA11/TA12. The abbreviation TA stands for twin aisle, in other

words for a roomy fuselage design permitting two aisles in the passenger cabin in contrast to the "thin-fuselage airplanes" (SA).

Airbus TA9

The airbus TA9 project involves a special version which is designed for routes having heavy traffic and medium length. According to market analyses the airlines would require such a further development beginning somewhere about the middle of the eighties. In comparison with the previous A300B2/B4 versions the airbus TA9 would have a passenger capacity increased by 25 percent. Also it is expected that the TA9 would be offered both in a short-range and a medium-range version.

In short-range transport the TA9 would be capable of carrying 350 and 425 passengers over 1,800-km routes with the required takeoff distances being about 2,100 m. The long-range version would be capable of transporting 325 passengers over a route ranging up to 5,550 km. Of course, the TA9 would coincide in all essential components with the A310/A300-600. It is true that such an aircraft would require engines of the 60,000-pound thrust class (266 kN). It is noteworthy in this connection that the TA9 in its below-deck freight space could carry more freight than a Boeing 747. The airbus TA9 version would have a length of 62.02 m and a wingspan of 56 m. In comparison with the current airbus A300B4 models the fuel consumption on a passenger-kilometer basis could be reduced by about 27 percent and would thus be even below the corresponding values of the Boeing 747SR whose economy in terms of fuel consumption has hitherto been considered to be unapproached.

Airbus TA11

Up to now the airbus family has specialized in short- and medium-route operation. For long-range transport Airbus Industry is still offering no airplane model. This should change when the TA11 is produced. This involves a four-jet further development of the A300/A310 with the TA11 wings largely identical with the already-designed TA9 version. The TA11 would be designed for long routes having passenger traffic which is not sufficient to be flown logically, for example, by a Boeing 747. Depending upon seat arrangement and passenger class distribution the TA11 could transport 228 to 253 passengers. On the basis of current engine technology the TA11 with 236 passengers would achieve a maximum range of 6,830 nautical miles (12,650 km).

Within the framework of the TA11 studies Airbus Industry has also investigated the possibility of a three-jet aircraft with two engines supported by pylons below the wings and the third engine positioned as in the DC-10 or the Lockheed TriStar in the tail. Surprisingly, this investigation showed that the four-jet airplane for a given passenger capacity and route length would have a total weight less than a corresponding three-jet airplane having an engine in the tail. In addition, for practical flight operation in the four-jet version there would be a simpler CG management. Despite the four-jet construction Airbus Industry calculates that the TA11 would still be 60-percent identical with the A300/A310 initial version.

Designed for the expected high passenger numbers of the late eighties is the airbus TA9 which can carry up to 425 passengers and would range substantially below present-day airbus versions in terms of its passenger-kilometer costs. However, the development of a new wing would be unavoidable which would also be usable on the four-jet TA11.

A model to succeed today's DC-8 and 707 fleets is the four-jet airbus T11 offering which is specially designed for long routes having medium passenger traffic and which would also probably encounter a substantial market potential in the middle of the eighties.

Airbus TA12

As a third airbus further development the TA12 is also under discussion. This is a version having medium passenger capacity for medium-long-route ope-ation, for example, in continental transport within the United States. Depending upon passenger seat arrangement the TA12 would offer somewhere between 228 and 253 passenger places. At a passenger loading of 236 the TA12 would be in a position to fly over routes ranging up to 9,100 km.

Which of the last-mentioned A300/A310 further developments will have the greatest priority is something to be determined by the market. However, the dramatic deterioration of the operating economics of older four-jet long-route transport airplanes as a result of the aircraft fuel cost explosion puts the market chances for an aircraft like the TA11 in a particularly favorable light. Therefore one may proceed from the assumption that even if the 320 program of current planning is fully carried out the airbus versions TA9 and TA11 will be required in the second half of the eighties and will therefore be built. This would mean that in a not-too-distant future there would have to be an official program start for one or the other version. If as expected the current depression in international airline transport is soon overcome and passenger figures once again display their customary rates of growth then the TA9 and the TA11 will probably be quite soon called for by the market. The coming months will bring interesting decisions.

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CSO: 3102/150

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JPRS 80399

24 March 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 97

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JPRS 80399

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ELECTRONICS

GOVERNMENT TO AID PRIVATE ELECTRONICS FIRM

Paris ZERO UN INFORMATIQUE HEBDO in French 8 Feb 82 p 5

[Unsigned article: "Three Lines to Be Developed by Intertechnique with State Aid"]

[Text] "Government aid is not reserved exclusively for public enterprises," stated Jacques Maillet, president and director general of Intertechnique, the last of the private French manufacturers of data processing systems. His company and the government have just signed a "data processing and office automation" agreement, backed by 85.6 MFF in public financing. Mr Maillet attributes this confidence on the part of the authorities to the good financial standing of his enterprise, whose 1981 business turnover is estimated at 635 MFF, with a net profit of 33 MFF, or a return rate of 5.2 percent (net profit/turnover).

Mr Maillet explained that the satisfactory results of Intertechnique are due to the sound financial structure of this enterprise, "managed American-style to be internationally competitive." For 1981, he expects a turnover of 635 MFF (+25 percent), including 282 MFF (or 44.5 percent) for its data processing and instrumentation activities, 305 MFF for aeronautics, and 48 MFF for remote sensing.

He calmly cited low financial costs (1.3 percent of turnover in 1981 and about 2.8 percent this year), and a serious effort in self-financed research, or 8 percent of turnover.

While Mr Maillet hopes to devote a large portion of the profits to research, he is not turning down the government-sponsored research contracts. It must be remembered that Intertechnique cooperates actively with the Data Processing Agency on pilot studies such as Surf, Sirius, or Kayak. However, the Sirius-Delta distributed data-base management system, designed around three Realite 2000 computers, is not yet officially on the market.

After one year of negotiations, Intertechnique signed a "growth contract" with the government on 28 December of last year.

Progress of 40 Percent per Year

This data processing and office automation plan amounts to an investment of 418 MFF between now and 1985, including 250 MFF for studies. Government support amounts to 85.5 MFF, including 61.5 MFF in direct aid and 24 MFF in 15-year participatory loans at a discount rate of 9 to 11 percent. The remainder of the project will be financed at 364 MFF by the profits derived from the data processing activities of the group, which according to Daniel Blonde, deputy director general, are "definitely profitable."

In return for the government support, Intertechnique is committed to increase its data processing business by 40 percent per year over the next five years, and to increase its capital funding by 30 MFF in 1982.

Intertechnique figures (in million FF)

	1980	1981	
Intertechnique SA			
Turnover (parent company)	509.10	635	24.7 %
Net profit	25.77	33	28 %
Data processing and instrumentation			
Turnover	217.40	282.10	29.7 %
Remonte sensing and systems			
Turnover	43.30	48	10.8 %

Intertechnique's Capital

Intertechnique's capital is currently held by Marcel Dassault (20 percent), the SMarcel Dassault Central Company for Studies (9 percent), the Groupe Rivaud (18 percent), Jacques Maillet (13 percent), and by private stockholders for the balance.

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BRIEFS

SWEDEN DESIGNS OWN CHIPS--From now on Swedish electronics companies do not have to import advanced highly integrated circuits, so-called chips. The section for electronic technology at Lund Institute of Technology has now for the first time shown that it is possible to build actual highly integrated circuits outside semiconductor companies. Building a highly integrated circuit consists of writing a computer program which generates the desired geometric patterns on the chip. The computer programs required for this have been developed at Lund. The entire computer system for the fabrication, including the display screen terminal, does not have to cost more than 35,000 kronor. This must be compared with normally at least 1 million. The fabrication of the chip itself will even in the future be reserved for a small number of "silicon foundries," but the construction work can therefore now be spread out to those who have the system knowledge. "The most interesting is that Swedish industry from now on will be able to maintain its competitive ability internationally," says Dr. Tech. Lars Philipson at the Institute of Technology. So far Sweden has been one step behind the United States and Japan. Now we ourselves can manage the development of components without having to rely on the goodwill of other countries. Those companies which have had to order "tailored" curcuits have had to pay for a high "entry ticket." This involves amounts in the millions just to develop prototype examples. [Text] [Stockholm DAGENS NYHETER in Swedish 6 Feb 82 p 23] 8958

ENERGY

EXPANSION OF HIGH-SPEED TRAIN NETWORK PLANNED

Paris L'USINE NOUVELLE in French 4 Feb 82 pp 45-46

[Article by Didier Dalem]

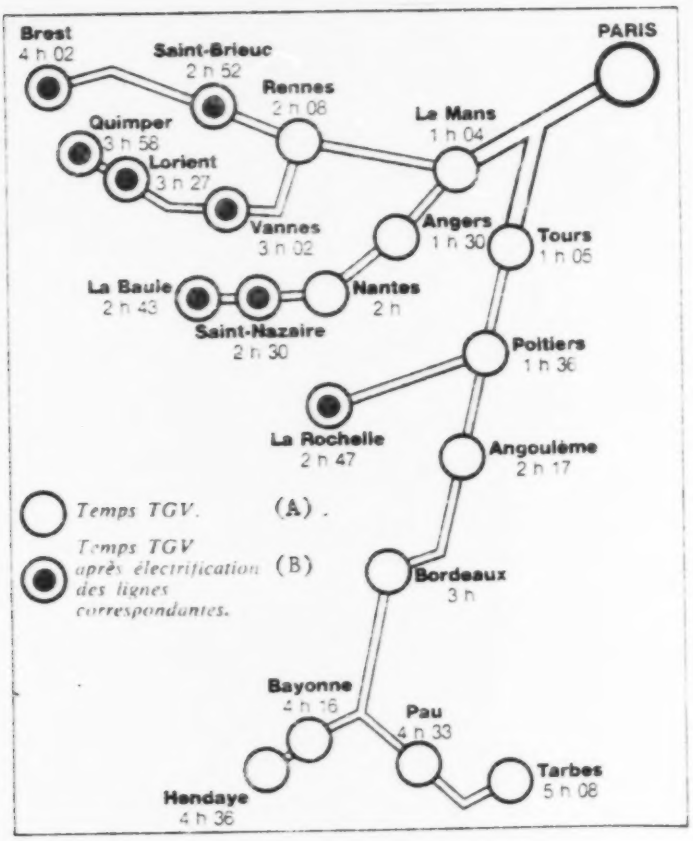
[Text] The French railway industry is being restructured around two major axes: Alsthom-Atlantique and Francorail-MTE. The placement in service of TGV Atlantique would work in their favor. But if the decision is taken, the first orders would not be ready before 1984.

The board of directors of SNCF (French National Railroads) has said "yes." The study for the construction of a second TGV (high-speed train) for the Ouest and Sud-Ouest (called the TGV Atlantique) has been sent to Pierre Mauroy with its approval. The decision now rests with the government, but it is hard to imagine that it would oppose a project which was formulated last September at the request of Francois Mitterand.

The operation would represent a market of some 10 billion francs for the industry. At the present stage of the project, the plans are to build a new track of about 350 km (compared to 425 km between Paris and Lyon); it would consist of a single line of some 100 km starting in Paris, which would split into two branches south of Chartres, the first going up to Mans, and the second up to Tours. Beyond these two towns, the TGV trains would use the existing tracks, renovated to allow speeds of 200 km/h.

The rolling stock would consist of about 100 trains, longer than the ones currently in service for Paris-Lyon (ten cars instead of eight), and technologically more modern. Anticipated placement in service is 1988.

In addition to the very significant improvement in service that SNCF would offer travellers, this project would come just in time for all railway construction. A restructuring plan currently in preparation at the Ministry of Industry, would provide for the formation of two axes of reorganization around Alsthom-Atlantique (Groupe CGE) on one hand, and the Francorail-MTE group on the other, these being the two groups which already share the Paris-Sud-Est TGV market.



Key: (A) TGV time
(B) TGV time after electrification of corresponding lines

The major priority operation in this plan is the purchase of Soferval (former Franco-Belge) by Alsthom, a move which has already been unofficially announced by Noel Josephe, chairman of the Nord-Pas-de-Calais Regional Council. But the Groupe CGE subsidiary does not intend to inherit such an industrial facility without adequate firm orders. The Paris-Sud-Ouest TGV could thus provide orders for this plant, at a time when conventional SNCF and RATP (Independent Parisian Transport System) equipment investments are tending to level off.

The Problem of Order Continuity

Delays are still a problem. The government's agreement cannot be expected before several weeks, and will be followed by a lengthy public utility hearing. For the manufacturers, the first equipment orders cannot therefore become a reality before 1984, or even 1985. But the Paris-Lyon TGV cannot guarantee anything after June 1983 for MTE (Groupe Jeumont-Schneider) and October 1983 for Alsthom. This a gap of several months, which places order continuity in jeopardy.

There are two market expectations for the industry: exportation, which remains tentative, and above all, SNCF, which is presumably preparing to order a series of 12 new trains of the current TGV type, in addition to the 87 initially expected. Ten of these should help service Marseille, Montpellier, and Geneva, while the two others are intended for PTT's (Mails, Telephones, and Telegraphs) postal TGV project. A second series of 12 trains might follow by this summer, and should facilitate connections with Atlantique.

11,023
CSO: 3102/160

DEEP UNDERGROUND GASIFICATION PROJECT LAUNCHED FOR STUDY

Brussels LE SOIR in French 5 Feb 82 p 2

[Article by O. C.: "Underground Gasification at Thulin Started"]

[Text] From our special correspondent--A world premiere in Thulin, at a location close to the French border, has been the launching of a special underground gasification project. The Secretary of State for Energy, Etienne Knoops, led the event in the presence of many personalities: Michel Tromont, minister of national education; the Mayor of Quievrain; ministers Philippe Busquin (Walloon region) and Robert Urbain (executive of the French Community); Humblet, chairman of SRIW; Vaes, of the Hainaut government; the ambassador of FRG in Brussels; and many others.

A world premiere, because the industrialized gasification process being used today is geared for the exploitation of thick coal deposits located at low depths. But in the case of the present process, which could be applied at other Belgian--and even European--locations, the objective is to use gasification for exploiting coal deposits lying at great depths.

The many technical problems raised by this objective have been studied by Belgian experts at the National Institute for Extractive Industries, who have worked in close collaboration with German colleagues; all of them were part of a new organization, the Institution for the Development of Underground Gasification (IDGS).

Three Goals

The preliminary work culminating the lighting ceremonies on Thursday, began in 1979. The current experiment has three essential aims. First, to demonstrate that the technique called retrocombustion, developed at shallow depths to establish connections between borings, can be applied at great depths, despite the low permeability of the coal layers. Next, to create for the first time in the world, an underground gas generator operating at high pressure. And finally, to verify that the borings used for the gasification of a first deposit can be deepened and reused to exploit a deeper layer.

An intensive effort will be carried out, and a new future for the mining industry will depend on its results.

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CSO: 3102/157

BRIEFS

SECOND IN SITU GASIFICATION PROJECT--Two billion tons. That is the amount of our deep coal reserves. Its exploitation can now be contemplated thanks to underground gasification. A second program will be launched for this, after the experiments at Bruay-en-Artois. After several months of preliminary studies, a second four-year program for research on underground coal gasification will be carried out during the coming weeks at Nord-Pas-de-Calais. This program will be conducted by the Study Group for Underground Coal Gasification (CEGS), which brings together Charbonnages de France, the French Petroleum Institute, and the Bureau for Geologic and Mining Research; the group will base its studies on the information obtained from the first experiment, carried out at Bruay-en-Artois in 1980. The Haute-Deule site, northeast of Lens, was selected to burn a coal seam located at a depth of 800 meters, and to collect a combustible gas at the surface. For the Charbonnages personnel, this means carrying out the experiment to the end, and thus further than at Bruay-en-Artois. The first in situ lighting of the coal will take place in 1983. This second operation represents an investment of 125 million francs, and like the first tests, is supported by the EEC and the French government. The stakes are high, since underground gasification could make it possible to exploit the national deep coal resources, estimated at 2 billion tons. [Text] [Paris L'USINE NOUVELLE in French 3 Dec 81 p 75] 11,023

CSO: 3102/160

FRENCH LOOKING FORWARD TO EXPANDING COMPOSITES MARKET

Paris LE MATIN in French 2 Feb 82 p 25

[Article by Bernard Broustet: "Bordeaux, Capital of Composite Materials: a 2,000-Fold Market"]

[Excerpt] While Bordeaux got in on the ground floor with these materials, the reasons were not such as to generate much enthusiasm. The object was merely to make the French armed forces more effective. SEP [European Propellant Company] propulsion systems for French strategic missiles while SNIAS [National Industrial Aerospace Company] makes the mainframe. Both companies needed high-performance parts: the combustion piping has to withstand very high temperatures, while the missile body must not sustain damage from liftoff and thermal shocks.

Only composite materials were capable of meeting these requirements. Initially, glass fiber was used but was soon supplanted by carbon fiber and Kevlar; the latter two have very specific properties: Kevlar has better tension resistance, and carbon has better resistance to compression and, strangely enough, heat.

There are obviously immense advantages to working in such a strategic area. Cost prices are not overwhelming, and the order book is large enough to obviate concern for the long term. SEP and SNIAS have taken advantage of these favorable conditions and run up a fabulous record in the area of high-performance composite materials. SEP has perfected 4D, which is composed of carbon fibers woven in four dimensions and is absolutely unique. SNIAS has developed in its factory at Saint-Medard-en-Jalles spinning and, especially, weaving processes that are in the forefront of world technology.

The possession of this technological potential is of stupendous importance, because high-performance materials are the wave of the future in countless fields. "There were the Stone and Iron Ages. Now we are entering the age of high-performance composites," says Mr Hugues, director of the Saint-Medard-en-Jalles factory. "We are sure that composites are going to burst into technology like the transistor."

The list of civilian applications already undertaken or under study is extremely impressive. SEP is already producing brake discs tested on the Ligier and the Elf motorcycle. In the area of disc brakes, it hopes to win the large Airbus market. It has perfected drive shafts and helicopter brakes that are much more effective than mechanical brakes. It has signed a contract with Peugeot to develop a car for the year 2000 that will burn 3 liters per 100 km and contain many parts made of composite materials: body parts, suspension triangles, etc.

There are other applications that might be surprising on first sight; prosthetic joints. "Originally, it was a coincidence," said Mr Malassine, director of civilian applications. "We met a surgeon at an exposition and talked to him about our products. He told us they should 'get off on the right foot' in prosthetics."

Indeed, they do seem to work. Carbon-fiber prostheses are not rejected by the body. They are extremely supple and have an indefinite life expectancy, unlike present prostheses, which have to be replaced about every 5 years. As of now, conclusive experiments have been carried out on sheep hips. An application will probably be made to the human body by the end of the year.

SNIAS is also thinking about civilian applications. Tubes for offshore drilling are being developed that are light and durable and should considerably improve oil exploration. Some thought is also to be given to automobiles, in collaboration with Renault. In the near future, materials are expected to be developed for compressed gas storage (e.g. butane canisters) in collaboration with Composite HP, a small subcontractor located near Bordeaux that is doing a land-office business.

France and especially the province of Aquitaine seem to be off to a good start. They benefit also from the 5 university laboratories working in this area. And there is regional political and economic support; at the urging of the expansion committee and with the blessing of the regional council, the CODEMAC [expanion unknown] think-tank has been formed, bringing together researchers, engineers, politicians, and economists.

Working through the regional office, CODEMAC has sent to Paris a report on the establishment of a national institute for composite materials. This institute's mission would be mainly to disseminate information, train instructors, meet the needs of the PMI [small and middle-sized industries], and promote automation processes. If created, the institute would confirm Bordeaux and the region as the driving force in this area. This role was recognized by Jean-Pierre Chevenement at the last research meeting.

It is up to local politicians to continue to work to have this plan implemented. It has to be done. It gives Aquitainians a chance better than any they have ever had to show they can make something other than wine or goose-liver paste.

A Promising Market

The outlook for growth in the use of composites is staggering. If we are to believe a study from the Courtaulds group in the United States, use of composites should increase 8-fold by 1990 in the field of aeronautics and 2,000 times in automobile manufacturing. Judging by a document from Ford, the use of composites can reduce the weight of the body and doors by 61 percent, the shock absorbers by 74 percent, and the suspension springs by 80 percent.

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CSO: 3102/152

MINISTER OF INDUSTRY COMMENTS ON INDUSTRIAL POLICY

Paris L'USINE NOUVELLE in French 3 Dec 81 pp 66-68

[Interview with Pierre Dreyfus, minister of industry]

[Excerpt] Step by step, the minister of industry is shaping the new industrial policy, founded primarily on the protection and development of France's assets. Pierre Dreyfus explains it in his own words.

[Question] In what way is your policy a new one?

[Answer] It is new in the sense that if we pursue a policy of aid for advanced industries, we also help one by one, the traditional industries which provide the majority of the industrial employment. But our action is a recent one and the path is arduous, because the traditional industries have been abandoned to their own devices for too many years. I might point out that at the same time, we must support enterprises which are encountering difficulties, and launch nationalization.

[Question] All the branches cannot be helped equally; you will have to choose.

[Answer] Of course we will have to choose. The industries are undergoing transformations: some are developing rapidly, others are retrenching and finding other orientations. In the textile industry for instance, the creativity and quality of French fabrics were much more sustained in the past than they are now. But this will change. Since the industrialists gathered the impression that the ministry was interested only in advanced industries, and that the international division of labor was all that mattered for the rest of them, it was all somewhat discouraging. Especially since they were being told that the situation was worsening every year. But we are saying that it will not become worse, neither for textiles nor for machine-tools.

[Question] How can you reconcile employment priority and competitiveness, hiring and automation, recapture of the domestic market and an orientation toward the outside?

[Answer] Employment will be very threatened if the manufacturing industries retain their old machinery. It will be threatened because it will no longer be competitive. If the automobile industry does not rapidly change its means of production, we can be sure that it will not be able to provide as many jobs in the future. The machine-tool plan has been formulated specifically to reconcile employment and competitiveness.

[Question] The manufacturing business has moved from expectation to a certain mistrust. Can you change this attitude, and how?

[Answer] I am not so sure that business leaders are distrustful. In the Midest, in Lyon, I met industrialists who were often gloomy, but I did not find them hostile toward us. I even felt a certain warmth. I rather feel that enterprise directors are more concerned by the state of their businesses than by politics.

[Question] Do you believe that industrialists will invest?

[Answer] Yes, as long as the pump is primed, and it will be primed by public investment. I am optimistic because I know that this will take place after consumption starts anew, a situation which we see to be true. On several occasions, in periods of crisis, public investment ushered in private investment; that is what will occur in 1982.

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CSO: 3102/160

MINISTER OF RESEARCH INTERVIEWED ON RESEARCH, DEVELOPMENT PLAN

Paris LE NOUVEL ECONOMISTE in French 11 Jan 82 pp 33-34

[Interview with Jean-Pierre Chevenement, minister of Research and Technology, by Gilles Coville: "Jean-Pierre Chevenement: How to Catch Up With Germany"; date and place of interview not given]

[Text] LE NOUVEL ECONOMISTE: The report on the 1970's that you have drawn up is rather favorable to businesses that have increased their research budgets, while the government, all things considered, has reduced its expenditures. How can they now be encouraged to do more?

Jean-Pierre Chevenement: Business started out so low that all they could do was increase their research effort. However, the share of research financed by industry, about 0.8 percent of the GDP [gross domestic product] of France, is still not up to the levels of German and Japanese industry, about 1.2 percent. The problem is how to go about making French business increase its effort. Habits are hard to form, and I think a whole panoply of measures will have to be orchestrated: aid from ANVAR [National Association for the Valorization of Industry] will have to be increased and diversified; there will have to be mobilization programs bringing together large research organizations, technical centers and businesses; tax support, which I would like to see studied; middle- and long-term credit for innovation; action by INODEV [expansion unknown] and financial companies supporting innovation to help innovative businesses increase their own capital; reform of technical centers, etc.

As all that cannot be done immediately, I am also counting on the pilot role that national corporations must play; they provide about half of national industrial research money.

LE N.E.: Do you see research as one of the subjects that government and management can agree on?

J.-P. Chevenement: I feel that professional leaders are aware of the challenge of research and technological innovation. They are ready, but at the moment they have not yet made the necessary effort in many fields. I expect the industrialists really to loosen up. I don't just want 1,300 businesses doing research. The number can easily be doubled. We can look down the road a few years and set a much more ambitious objective: more than 5,000 businesses. ANVAR will have helped nearly 2,000 companies already in 1982. So we are getting into gear. Of course, you have to realize that what you can expect from a company differs greatly according to its size. For a small or middle-sized company, doing research means first of all improving its technical knowledge and creating a minimum number of structures that will

enable it to gain access to technical centers and public research laboratories.

LE N.E.: You have set a very ambitious general objective: to devote 2.5 percent of the GDP to research by 1985. Will budgetary constraints allow you to reach this objective so quickly? Aren't you already having trouble putting this ambition into practice?

J.-P. Chevenement: The government's objective is ambitious, of course, but it does show its desire to see France move into the forefront of developed countries in its capacity to invest in research and technology. The 1982 budget already shows our desire for recovery, and its growth corresponds to the objective set for 1985. The plan that will be set forth will include the objectives outlined in the interim plan. This interim plan, as you know, provides for an increase in civilian research budgets of more than 17 percent a year between now and 1985. Of course, you don't think I can get all that without putting up a fight. You certainly wouldn't believe me if I told you differently. Come back in 1985!

LE N.E.: In research and technology, what strengths do you want France to have that competing countries like the United States, Japan or the FRG have?

J.-P. Chevenement: I don't think that an American, Japanese or German model can be transposed to France. Every country has its own traditions, cultural context, and spirit. However, I do note that in the United States, ideas circulate better and faster: there are fewer barriers between federal agencies, public laboratories, and industry. In Japan, I note that the Miti has been able continuously to have all its partners work together and effectively direct both industrial and university research into a few promising directions that are great technological challenges (microelectronics, information processing, and biotechnology). Japan also possesses a very advanced system for collecting and disseminating scientific and technical information: a multitude of terminals located throughout the country make it possible to find out what is going on in the world on any subject. As for the FRG, I think its industry realized back in the 19th century how important research is. It has recruited engineers trained for research in the best universities ("Technische Hochschulen"). The directors of big business are often men who have come up through the laboratories. The link between university laboratories and industry, particularly in chemistry, is a part of their culture. I would also add that for the last 26 years, the FRG has had a powerful motivating force behind research policy, the BMFT (Federal Ministry for Research and Technology). This structure and the political will behind it has made Germany catch up with and pass us; in most of the great branches of industry, research is much greater than ours.

LE N.E.: You wanted a great national debate on research that would be both democratic and efficient. Which won out: democracy or efficiency?

J.-P. Chevenement: I have the weakness of thinking that democracy is not incompatible with efficiency but rather ensures it. In any research work, be it in a laboratory or in a great cooperative project, efficiency implies the circulation of information, defining needs, dialogue, exchanges.

A colloquium and the time spent in preparing for it are not time wasted, judging by the fundamental convergences that are already appearing. No one contests the necessity of an unequaled effort in scientific research and technological development.

There are grounds there for a certain national unity, and that doesn't happen so often that it fails to attract our attention. Everybody agrees on a comprehensive policy of scientific information and development of technical education, and on the fact that researchers have something to do in this field. That implies a more open concept of the researcher's vocation. I think the whole thing is well under way.

The problem of scientific employment has been set forth in a completely new way by taking into account not only the personnel of public organizations but also those who work in industrial research. People are coming together on the idea that the development of basic research should go hand in hand with application. But you can't convince researchers of this unless some guarantees are made to them: no mobility without corresponding social progress.

Another idea has been forcefully expressed: the regional dimension, which a policy of technological research and development must take into account. The regional bases are extraordinarily rich: every region has in some way outlined the future it prefers.

Finally, priorities are taking shape in certain sectors, such as scientific instrumentation, biomedical engineering, medicines, and the agricultural-food industries. In sum, the debate over regional bases a sector colloquiums have caused the notion of "moblizing programs" to emerge. This programs will bring together a coherent pattern of technological and industrial research and development and will do for France in the 1990's what the great technological projects of atomics, space and aeronautics did in the 1960's in the context of a policy of national independence.

By leading the way for business, the mobilizing programs will have a multiplying effect on a whole series of branches of industry where research has so far been insufficient: construction, mechanics, agriculture-food, etc.

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CSO: 3102/149

NATIONAL CONFERENCE ON RESEARCH, TECHNOLOGY

Paris ZERO UN INFORMATIQUE HEBDO in French 25 Jan 82 p 36

[Report by Fabienne Tisserrand]

[Text] If, as Pierre Mauroy indicated at the close of the National Conference on Research and Technology, research must help "the country out of its crisis," the priority among priorities "might be data processing." Indeed, microelectronics, data processing, and software have been characterized by one of the conference commissions as "strategic areas of exceptional importance," on a par with energy and raw materials. As for robotics and the automation of the means of production, they belong to "sector of technologic domains associated with production and national independence."

"An economy which imports its equipment requirements is in danger of becoming lastingly dependent on foreign suppliers, thereby losing control of its production processes and of the development of its employment structure."

The work of this conference has brought out the need to consider the international aspect of research. Trends in technology cannot be visualized in a strictly national context: in 20 years the French will represent 1 percent of the world's population.

The conference findings suggest "working towards a unified European research, technology, and industrial effort," this being one of the conditions for escaping the technologic and economic domination of Japan and the United States, especially in the field of data processing. It should also help transfer scientific and technologic achievement toward the Third World.

For 1985, the government has set itself an ambitious goal: to reach a research and development budget which will represent 2.5 percent of the gross domestic product.

Competent Researchers

According to one of the commissions, what this means in practical terms is the hiring of 3000 researchers per year in industry, and 1000 in public research.

Can training facilities guarantee the qualification of such numbers of researchers in such a brief period? Is there not a risk that their competence will suffer? Will the available legislation allow for eventual retraining in cases where evaluation criteria, which are essential for good research, might make this necessary?

An Interconnecting Network

According to one of the study groups, the whole of industrially-oriented technical research must "tend to form an interconnected network at the national as well as regional level." The group proposed the formation of an ANRT (National Association for Technical Research) type agency, to coordinate technologic research, or to organize liaison between public research and PMI (small and medium-sized businesses), especially at the regional level, and with the support of ANVAR (National Agency for the Valorization of Research).

The latter solution is the one adopted by the government: the Prime Minister has announced an increase in the ANVAR budget, which will reach 760 MFF for 1982. Consequently, this organization's aid to PMI will be expanded.

The Technologic One Percent

In order to finance the various technologic research centers, the commissions are proposing "the technologic 1 percent."

This measures provides, over a few year's time, for the gradual replacement of parafiscal taxes with a general tax on enterprises, which would amount to 0.3 percent of the value added by each enterprise.

Enterprises seeking technical assistance could approach any private or public industrial research center, "provided that the latter is approved and recognized for the purposes of technical assistance."

The government would then cooperate on an equal share with the enterprise, in financing the technical assistance and applied research.

The conference brought out the need to establish "a public agency for technologic options," responsible for conducting several concurrent independent studies on socioeconomic and ecologic impact. In response to this proposal, Jean-Pierre Chevenement has anounced the establishment of a generously endowed Institute for Projection and Forecasting, to "clarify options and strategies" and to coordinate the units distributed among ministries, professional sectors, enterprises, and regional organizations.

Following the example of newly introduced data processing in enterprises, one commission suggested the formulation of "a methodology for introducing new technologies in enterprises, in the form of minimum regulations to be observed," with its application being supervised by an enterprise committee.

Chevenement's Proposals

The research and development budget, amounting to 50 billion FF in 1982, is to be increased by 30 billion constant FF by 1985 (or an increase of 17.8 percent per year).

The role of public organizations (CNRS (National Center for Scientific Research), Inria (National Institute for Data Processing and Automation Research), AEC, and so on) and of universities, will be strengthened. They will assure the development of tomorrow's major technologic processes, support inter-sector research projects, and encourage the dissemination of technologic education in the social and economic structure.

A new type of public organization, of a scientific nature, will be studied.

A new decentralized research policy will take into account the development of regional centers for research and technology. ANVAR, already regionally established, should help make PMI more responsive to new technologies. Its role and budget will be increased (760 MFF for 1982).

Democratize research: at the national level, the government will propose that Parliament acquire an office for evaluation of technologic options, to be staffed by members of parliament.

A higher council for research and technology in the Ministry for Research and Technology, half of which would be composed of science personalities, and half of representatives from enterprises, unions, and professional associations, would have to be consulted about major decisions in scientific and technical policy.

At the regional level, consulting committees would be established at regional councils.

In order to be recognized as such, scientific research specialties will benefit from special reference job descriptions; the job descriptions of personnel in various public research organizations, while retaining their specific nature, will be coordinated and adapted to allow free circulation of personnel among public organizations, educational structures, and national enterprises.

The creation of new jobs at the rate of 4.5 percent during the coming years, will lower the average age of researchers.

The establishment of a training policy should attract the younger generation to research. Specific training programs will be undertaken in the microelectronics sector.

An attempt must be made to double the number of research engineers by 1985, with the set goal of having trained 1000 engineers by that date.

An Institute for Projection and Forecasting will be generously endowed.

Establishment of CESTA

At last Wednesday's session of the Council of Ministers, Jean-Pierre Chevenement presented a statement on the creation of a Study Center for Advanced Systems and Technology (CESTA), which will be located in the former building of the Ecole Polytechnique, alongside the Ministry of Research and Technology.

The major objective of CESTA will be to contribute to the development and dissemination of new technologies, while analyzing and preparing means to integrate them into the social, economic, and cultural structures of French society.

In order to carry out this program, CESTA will be organized into four major tasks:

Studies and research (for which a scientific and technologic projection mechanism will be established);
Assistance for technologic options;
Training;
Support and dissemination.

In particular, CESTA will act as liaison with regional and national associations established as a result of the National Conference on Research and Technology, to further investigate and assure the valorization of the analyses and proposals accumulated during the last six months. CESTA's activities will begin in March-April 1982.

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CSO: 3102/156

FRANCE'S PARTICIPATION IN CIVIL AIRCRAFT PROJECTS REVIEWED

Paris L'AERONAUTIQUE ET L'ASTRONAUTIQUE in French No 6, 1981 pp 3-22

[Excerpts] Airbus Industrie

The Airbus A-300 and A-310 continue enjoying substantial marketing success, with the number of A-300's now on order (price: around $40 million) totaling 316, of which 237 are firm orders, and that of A-310's being 153, for a sum total of 469 planes on order by 40 different airlines. Production, which is shared by some 120 French firms, suppliers of structural elements and equipment, is now proceeding at the rate of 4 planes a month (44 planes for 1981).

A-300

The A-300, with 144 planes in service having totaled 750,000 flight hours, is a medium-range airliner propelled by two SNECMA [National Aircraft Engine Study and Manufacturing Company]/General Electric CF6-50C2 or by two Pratt and Whitney JT9D-59A jet engines, carrying normally 269 passengers with baggage and flying at a speed of Mach 0.86. There are two versions, the A-300-B2 with a maximum weight of 142 tons and a cruising radius of 3,200 km, and the A-300-B4 with a weight of 157.5 tons and a range of 4,800 km.

The diameter of the fuselage is optimized for seating 6 to 9 persons per row with two aisles for circulation. Underneath the floor, the hold can accommodate either two LD3 containers side by side, or one LD1 container, or one LD6 container, or one pallet.

The plane has obtained a Category III B certificate of navigability for the versions produced for Air France and Air Inter.

In December 1980, it underwent its first digital automatic all-weather landing tests using an SFENA [French Air-Navigation Equipment Company]/Smiths installation of reduced volume and weight.

We note also that:

--MBB [Messerschmitt-Baldow-Blohm] at Hamburg has run a test evacuation at night and without lighting using inflatable exit ramps (280 passengers were evacuated in 90 seconds);

--The conversion of a passenger transport plane to a mixed cargo and passenger version can be completed in 24 hours;

--One of the last orders received is that of Saudi Arabia, for the A-300-600 version powered by Pratt and Whitney jets. (Its first flight is scheduled for May 1983.);

--A rudder made of carbon fibers in Hamburg (20 percent gain in weight) has been tested in flight at Toulouse prior to mount it on the planes ordered by Lufthansa;

--For the fabrication of its thousands of sheet metal parts, the Bremen plant has installed a special workshop equipped with stamping presses ranging up to 26,000 tons, automated machine tools and robots equipped with optoelectronic sensors for the displacement and assembling operations.

A-310

The A-310, 153 of which have been ordered by 11 airlines, its first flight being scheduled for the end of April 1982, will have not only a shorter fuselage but also a new airfoil profile.

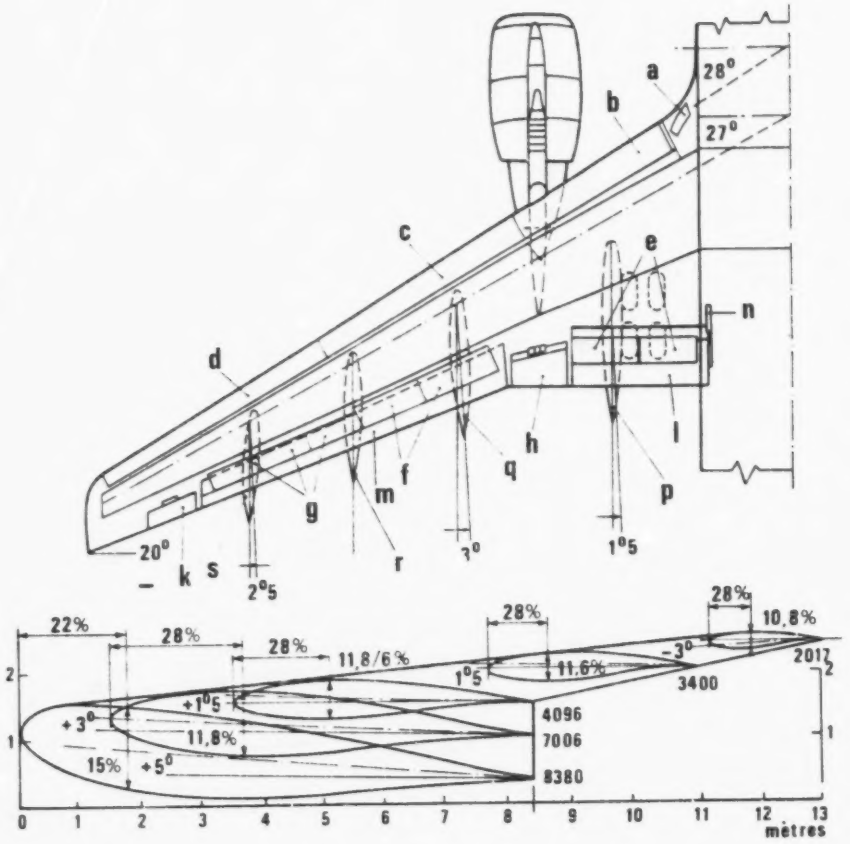
The wing (Fig 17), which has a sweepback of 27 degrees at one-fourth the chord, has a span of 43.9 meters, an area of 219 square meters and an aspect ratio of 8.8, supercritical profiles of 15-percent thickness ratio at the root and 10.8 percent at the tip, and an aerodynamig twist corresponding to an angle of +3 degrees at the root and -3 degrees at the tip. It has on the leading edge a small Kruger tab (a) and slats (b, c, d); on the trailing edge air-brake spoilers (e, f, g); an all-speed aileron (h), a low-speed aileron (k) and flaps (l, m) whose trackways are located respectively in (n, p) and (q, r, s). A 1/10-scale elasticity-test model built by VFW [expansion unknown] was tested in the ONERA [National Office for Aerospace Studies and Research] S2 wind tunnel at Modane; the results obtained fully confirmed the calculations relative to flutter.

The interior configuration of the fuselage was studied and a full-scale model built by MBB in Hamburg. Passenger headroom has been increased by 70 percent, which will improve comfort and permit the overhead luggage compartments to be made larger.

The pilot's station, of the FFCC [forward-facing crew compartment] type, will benefit from the experience gained in the most recent versions of the A-300. The on-board auxiliary generator will be a Garrett GTCP-301--smaller, more economical and quieter. Stowage under the floor will accommodate 14 LD3 containers.

The forward landing gear will be the A-300's Messier landing gear.

The plane will also be available in a convertible version, the A-310-C, and in a cargo version, the A-310-F, which can take on 12 pallets measuring 3.2 meters by 2.25 meters each, and even, if need be, 16 pallets arranged two rows abreast. The payload will be 36.8 tons on the A-310-C and 39.4 tons on the A-310-F. Both



Key: [see text]

Fig 17 - New Airfoil for A-310.

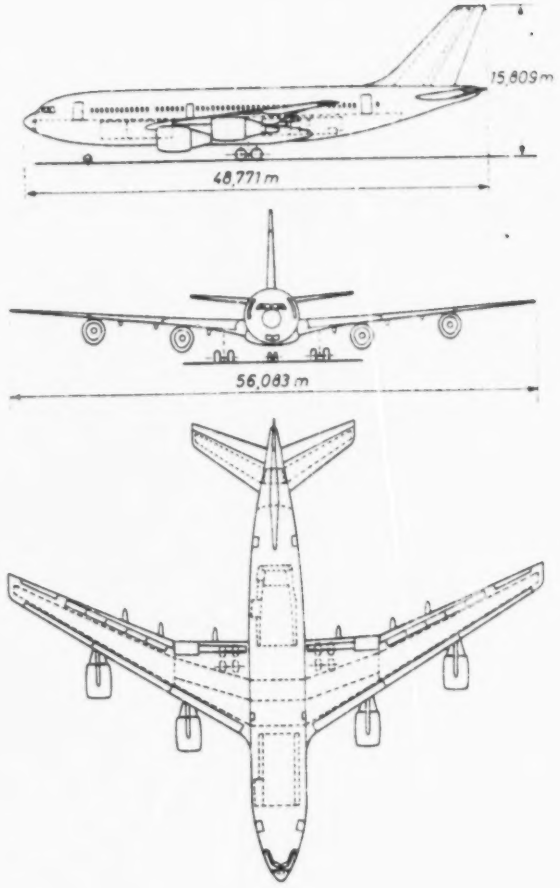


Fig 20 - Side, front and plan profile views of TA-11.

versions will have a large lateral loading hatch 3.58 meters wide by 2.57 meters high. They will be able to cover a distance of 5,600 kilometers.

The building of the three prototypes is proceeding at a lively pace. The AEROSPATIALE [National Industrial Aerospace Company] plant at Saint-Nazaire delivered fuselage section 15/21 to Toulouse on 16 May 1981, the after section 16/19 built by MBB in Hamburg arrived on 28 June and the fore section 13/14 built by MBB at Bremen arrived at the same time, enabling assemblage of the hull.

TA-9, TA-11 and TA-12

The Airbus extension projects, namely, the TA-9, a 400-passenger jumbo jet in the economy version, and the TA-11, a four-engined jetliner designed to carry 220 passengers over distances of 12,000 km (Fig 20) and of particular interest to Lufthansa, will be equipped with a larger wing having a span of 56.08 meters, an area of 330 square meters and an aspect ratio of 9.5. The Fuselage of the TA-11 will consist of elements identical to those of the A-300 and A-310. The design departments are also working on a new project that has been baptized the TA-12. The plane, an intermediate one between the two above-mentioned designs, will be a twin-engined jet, carrying only 220 passengers, will have the same airfoil, and will cover a maximum distance of 8,500 km.

A-320

With the TA-9, -11, and -12 not scheduled to be put into service before 1988, the new French government has given the green light for the development of the A-320, a short-range twin-engined, 130- to 170-passenger jetliner, of which Air France has already reserved 50 (25 on firm orders, 25 options), and which could be avilable by 1986.

Two versions are being planned: The A-320-100 which will measure 36.04 meters in length and will carry 134 passengers, and the A-320-200 whose greater length (39.24 meters) will accommodate three more rows of seats and hence enable it to carry 152 passengers.

The wing, identical in the two versions, will have a span of 34.57 meters, an area of 125.8 square meters, and an aspect ratio of 9.5. The diameter of the fuselage will be 3.95 meters, that is, smaller than that of the A-300 and A-310, but nevertheless larger than that of the Boeing 727 by 19 cm. Its fuselage will thus provide increased passenger comfort. Passengers will be seated six per row, in two banks of three seats each, measuring 1.575 meters per bank, along a central aisle. The height of the fuselage, which will be 4.14 meters (3.95 meters on the Boeing) will enable the stowing of LD3 containers. The cockpit will be configured for two pilots.

The plane will be powered by two jets of the 11,300 daN-thrust class, which may be SNECMA/General Electric CFM-56-2000's or Pratt and Whitney 2-025's or Rolls-Royce/Japan RJ-500-35's.

It will have a cruising speed of Mach 0.76 at an altitude of 11,000 meters and can be ferried a distance of 5,700 km. Its other principal characteristics and performance ratings are given in the following table:

Item	A-320-100	A-320-200
Length, m	36.04	39.24
Span, m	34.57	34.57
Area, m^2	125.8	125.8
Empty weight, kg	39,500	40,800
Takeoff weight, kg	66,000	71,900
Maximum payload, kg	16,400	19,600
Total hold capacity, m^3	38.7	48.2
Fuel tank capacity, kg	18,800	18,800
Wing loading, kg/m^2	520	570
Thrust-weight ratio	0.34	0.32
Cruising range (with fuel reserves), km	3,500	3,700

ATR-42

In July 1980, AEROSPATIALE signed an agreement with the Italian firm AERITALIA [expansion unknown] providing for joint study of a regional transport plane.

Such a plane was defined, based on a comparison of the French SA-35 and the Italian AIT-230, and baptized the ATR-42. It will transport 42-46 passengers but will also be offered in a cargo version.

The decision to put it into production (estimated cost put at 1 billion francs, 40 percent of which for the account of France) was scheduled for the fall of 1981 following consultations with the airlines. As of 1 June 1981, 26 airlines had expressed interest in this plane and estimated their possible needs (200 planes). The world market is put at 3,700 planes, which could be sold at a price of the order of $5 million and produced at a rate of 4 per month.

Its overall length being 22.7 meters, its fuselage will provide a pressurized cabin 13.85 meters long, 2.57 meters wide and 1.90 meters high (volume: 44.8 m^3) that will accommodate 42 passengers at 32-inch row spacing, or 46 passengers at 30-inch spacing, seated 4 per row. It will have a toilet and wash-basin compartment, a buffet compartment, a hostess's seat and two baggage compartments, one forward and the other aft, with volumes of 6 m^3 and 2.7 m^3 respectively. The cargo version, which can be loaded through side hatches or by aft ramp, will accommodate five LD3 containers.

The wing, high and straight, will have a span of 24.57 meters, an area of 54 m^2 and a substantial aspect ratio of 11.3. It will consist of a rectangular, constant profile central section enveloping the nacelles of the two engines, and two conic end-sections equipped with deiceable leading edges. The tailplane will be T-shaped.

The main landing gear, with a 4.1-meter track (16.6 percent of the wingspan), will have on each side a dual-wheel assembly retractable into a streamlined lateral fairing. The nosewheel will also be dual.

The plane will be equipped with two turboprop engines, either Pratt and Whitney of Canada's PW-100/2 (formerly PT-7) or General Electric's CT7-9 rated at 1,800 shaft horsepower.

Its empty weight will be 9,060 kg and it will carry a payload of 3,800 kg (42 passengers) a a fuel weight of 1,640 kg, giving it a takeoff weight of 14,500 kg (wing loading: 270 kg/m^2; load per hp: 4 kg). The maximum commercial loading will be 4,720 kg and the maximum fuel load (4,500 kg) will permit the plane to cover a distance exceeding 2,000 km unloaded. Its maximum cruising speed will be 510 km/hr and its range, with 42 passengers on board and the customary reserves, will be 1,300 km, coverable in 3 hours at an average speed (takeoff to landing) of 440 km/hr. Its fuel consumption will be around 520 kg per hour at an altitude of 6,000 meters.

9399
CSO: 3102/144

SAAB, VOLVO DEVELOP PURE METHANOL ENGINES

Stockholm NY TEKNIK in Swedish 28 Jan 82 p 4

[Article by Norbert Andersson: "NY TEKNIK in Saab's Secret Laboratory: The Swedish Alcohol Engine Well on its Way."]

Background

[Text] The development of the Swedish methanol engine was ordered by Svensk Drivmedelsteknik (formerly Svensk Metanolutveckling). Most of the project is financed by Stu with 4 million kronor.

Sweden got started late with the methanol engine as compared to, for instance, West Germany.

Earlier responsible authorities tended to mix in smaller quantities (10--15 percent) of methanol or ethanol in all gasoline for vehicles.

But in the government energy bill, which came last spring, the government presented a completely different attitude.

A number of car fleets will in the future run on pure methanol. Examples of such car fleets are taxis, the telecommunications administration and the post office.

Only a few percent of methanol will be mixed in. The purpose of this is to stimulate production by creating a market for methanol producers.

At the same time the plans for a 10-15-percent mixture of ethanol have been more or less buried. The reason is primarily the high price of ethanol as compared to methanol and the fact that the EC countries seem to lean towards methanol as a replacement for gasoline.

Sodertalje

Now the Swedish alcohol engine is coming. Volvo and Saab are each independently developing engines which run on pure methanol.

NY TEKNIK has as the first magazine been allowed to take a look at the development work in Saab's secret engine laboratory in Sodertalje.

In one of the many anonymous corridors in Saab's "secret building" the walls are rumbling faintly. It is here that the next generation of engines is being tested.

"One of the world's smallest engine laboratories," says Per Gillbrand, chief of Saab-Scania's engine development. But his voice carries a great deal of pride.

Here, in a sound-insulated room with flexible cords and hoses hanging from the ceiling, the methanol engine is being tested on a test stand.

"In this first stage of the development work we are trying to optimize the fuel-air mixture, the compression and the ignition adjustment," says Per Gillbrand.

The octane number for methanol is usually given as approximately 108. This is ten units more than for premium gasoline. According to current theories this should mean that through a higher compression one should be able to utilize the energy in methanol better than in gasoline.

"Purely theoretically methanol should give us up to 10% better energy utilization."

"But the question is to what extent we can utilize the high octane number of methanol."

The octane number is namely in part the result of a measurement method called the RON method, which is incomplete for methanol.

A single cylinder test motor is run at low speeds of rotation. The compression is increased continuously until the fuel is self ignited, which means that the engine knocks. The high heat of vaporization (great cooling capacity) of methanol makes it possible for the compression to be increased to a level which corresponds to approximately 108 octane for gasoline.

Supplementary Test

But there is a supplementary test, the MON method, where the test engine is run at higher speeds of rotation and with a preheated fuel-air mixture.

The MON value of the gasoline usually lies 10 units below the RON value, but West German tests indicate that the MON value of methanol lies as much as 20 units below the RON value. In other words, methanol then has the same MON value as premium gasoline.

This means that there is a risk that the methanol engine will knock at high speeds of rotation if the compression is adapted to the high RON value of the fuel.

And knocking at high speeds of rotation is considerably more dangerous than at low speeds of rotation. It is not detected by the unassisted ear but can destroy the engine in a few seconds. Saab has already run into engine damage of this type.

"A possible solution to the problem may be an engine with a relatively high compression, approximately 1:12," says Per Gillbrand.

It gives a high torque even at low speeds of rotation. At the same time it is necessary to choke the engine at high speeds, which means that full power will not be used. This is to reduce the risk of high-speed knocking.

Best in City Traffic

This solution reminds us of the H-engine, which sits in all new Saab models.

Since the torque is high at relatively low speeds of rotation, the engine can be geared high. This gives a low fuel consumption.

"A methanol engine of this type is probably most suitable in vehicles which are driven mostly in city traffic and which comply with Swedish speed limits. On the other hand, it is worse for free driving on West German freeways."

"Another problem with methanol is its sensitivity to 'hot spots.' A glowing flake of soot in the combustion chamber or a too hot spark plug can trigger a premature explosion.

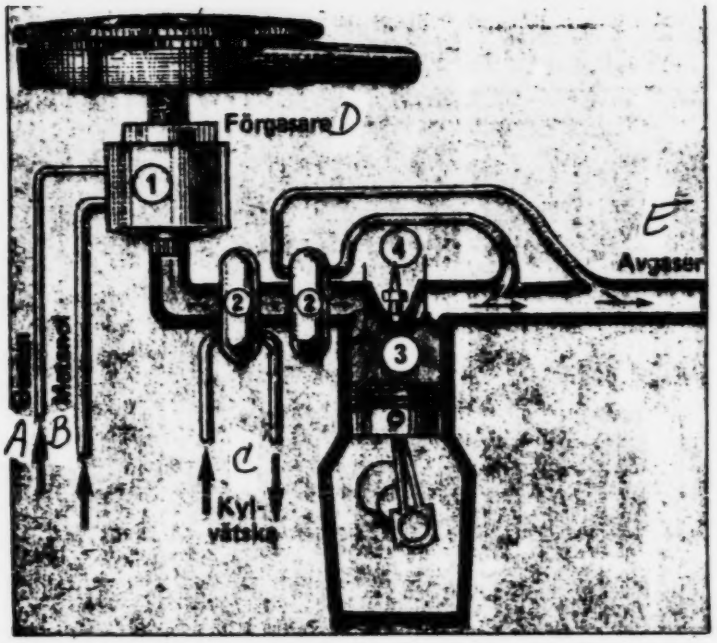
"If the explosion takes place in the compression stroke the quantity of heat released is charged to the cylinder. There is no audible warning, and it does not help to turn off the ignition. The engine can break down in an instant.

"In order to counteract the self ignition tendency we should possibly have a richer fuel-air mixture at high speeds of rotation in order thus to obtain better cooling in the cylinders," says Per Gillbrand.

"We may possibly also have to control the preheating according to both the speed of rotation as well as the external temperature."

In external appearance the methanol engine differs from the gasoline engine only in the preheating.

Saab has pulled the cooling water system up around the intake pipe. The pre-heating is necessary in order for the methanol to be vaporized and thus mixed optimally with the air.



Drawing by Ingemar Franzen

Basic diagram of methanol engine.

The carburetor, 1, differs from the gasoline engine primarily by the fact that in principle it has double capacity. The energy content of methanol is only one-half that of gasoline. In addition, the methanol engine will probably be started with gasoline.

The preheating, 2, can take place in part through the cooling water system, in part by pulling the exhaust system up over the intake pipe. Volvo has a combination of both methods.

The compression, 3, is increased to between 1:12 and 1:14. However, it is possible that the engine is choked at high speeds of rotation, which means that the power is reduced. The purpose of this is to prevent knocking and possible engine damage at high speeds of rotation.

The spark plug, 4, is of the cold type to prevent glow ignition. Methanol is considerably more sensitive to "hot spots" than gasoline.

Key: A. gasoline
B. methanol
c. cooling liquid
D. carburetor
E. exhaust gases

Expensive Over the Long Term

But the preheating does not operate when the engine is completely cold, i.e., for cold starting. Then one could use a separate starting fuel, most conveniently gasoline.

Or else, one mixes 10 percent isopentane into the methanol. However this becomes expensive over the long term. Especially since it corresponds to 20 percent of the anticipated gasoline consumption.

The reason is that methanol contains barely one-half as much energy as gasoline. In other words, the methanol engine drinks twice as much fuel as the gasoline engine.

One-and-one-half years of development work still remains before Saab can present its prototype of a twin-carburetor methanol engine. And many problems remain to be solved.

Among other things the cold starting, the exhaust gases, and the effect of the methanol on metals, plastics and rubber.

"I believe it would be simple to work with methanol," says Per Gillbrand. "Of course, the fuel consists only of one type of molecule, while gasoline contains a mixture of components, everything from asphalt to gas."

"But we actually know considerably more about gasoline than about methanol, which has given us a series of completely new problems."

For one thing, methanol can produce explosive gas mixtures in the fuel tank. On the other hand, the gasoline vapors are supersaturated and are not ignited.

The explosion risk can be avoided by mixing in 10 percent gasoline. This simultaneously improves the driving quality after cold starting.

Other problems show up only over the long range. Tests in the United States indicate that methanol can affect the lubricating oil of the engine and thus cause wear in the pistons and cylinders.

In addition, small quantities of formic acid are formed during the combustion. It can penetrate into the lubricating oil and lead to corrosion.

Per Gillbrand still promises:

"The day when methanol is commercially available as fuel for cars, we will also have a methanol engine in production."

Volvo is Already Test Driving Two Methanol Cars

Volvo is also developing a methanol engine, of a carburetor type.

While Saab is still working only on the test bench, Volvo has already from the start installed engines in two cars.

"We are testing the driving quality, cold starting and the ability of various materials to resist methanol," says Jan Allbjer, who directs Volvo's development of the methanol engine.

In order to achieve effective preheating, Volvo has pulled both the exhaust gas pipes and the cooling water pipes up around the intake pipe.

As starting fuel Volvo uses gasoline. It is pumped into the carburetor while starting and until the engine has become warm. In approximately the same way as a gasoline engine is choked.

In addition Volvo is driving on a mixture of 10 percent gasoline and 90 percent methanol.

"We at Volvo believe that adding gasoline solves several problems and expect that it will remain in the future too," says Jan Allbjer.

While Saab has had certain problems with knocking at high speeds of rotation--and has even had a case of engine damage--Volvo has not had the same problem.

"We have driven with varying compression ratios. Up to almost 1:14."

Neither has Volvo had problems with "hot spots" in the combustion chamber.

But like Saab's Per Gillbrand, Jan Allbjer says:

"The day when methanol is sold generally as car fuel we will have a methanol engine in production."

8958
CSO: 3102/162

GOOD YEAR FOR AIRBUS IN 1981, GOOD PROSPECTS

Paris ELECTRONIQUE ACTUALITES in French 5 Feb 82 p 9

[Unsigned article]

[Text] Speaking to the press, Mr Lathiere, managing director of the Airbus Industrie consortium, stated that 1981 has been a good year for his organization, which has avoided the crisis.

During 1981, Airbus received one-half of the world's orders for large carrier planes, compared to 24 percent in 1980. "Last year, we received firm orders for more planes (46) than we delivered (39)," indicated Mr Lathiere.

In 1981, the European consortium passed the 500-mark for planes on order; 43 companies have so far ordered 505 Airbus A-300's and A-301's, with 159 of them on option.

The production rate of the aircraft manufacturer is currently 4.2 planes per month, and the goal of the development plan is to bring this figure to eight planes per month. The number of people who are presently working for Airbus Industrie in Europe should therefore be more than twice as large by 1985, going from 20,000 to about 45,000 in three years.

Describing the development prospects for Airbus A-320, for the time being ordered only by Air France, Mr Lathiere assured the press that a decision for industrial production will be made before the end of the quarter. Airbus Industrie is still hoping to receive the support of the American company Delta Airlines, as a second launching company, while emphasizing that the A-320 will be equally as profitable outside the United States.

The inception of this program would be an opportunity for realigning the participation in the European consortium, and for eventually adding new partners; contracts have been signed with Italy, Yugoslavia, and Japan; Belgium and Canada have also expressed interest in this new program.

11,023
CSO: 3102/157

ATR 42 EXPECTED TO FILL IMPORTANT NICHE IN COMMUTER MARKET

Rome LA REPUBBLICA in Italian 7/8 Feb 82 p 36

[Text] The 1970's envisaged the inauguration of a new system of air transportation: one that would respond to the requirements of traffic involving regional areas or urban centers having a volume of demand less than that prevailing on the principal international and national routes. "Third-level" transportation was accordingly developed to provide the smaller centers and regional hinterlands with the possibility of becoming integrated into the network of air services linking the major airports, and also to contribute a flow of local and occasional traffic to those airports.

In the economically developed countries--principally the United States--this function has taken on considerable importance, meeting the demand for third-level, or "commuter," services: a term used to identify the aircraft themselves that serve these routes. The commuter planes, in fact, solve the problems not only of the passengers but also of the airlines--which are condemned to suffer escalation of the costs of operating the large jets since the petroleum crisis--on routes that have a relatively light flow of traffic. Moreover, they have shown themselves to be the most suitable means of air transport for short hauls and for markets that are in the process of developing.

The commuter planes, generally speaking, have no more than a 50-seat capacity. They are designed for short-haul flights (of several hundred kilometers) and offer the advantage of operating costs that are substantially lower than those of jet aircraft such as the DC 9 for those routes on which planes of the latter type become uneconomic to operate. The result is that these communities are deprived of air service, or the service is maintained only at the cost of a great deal of strife.

In the United States, the "deregulation"--which has liberalized the marketing policies of the airlines at the first and second levels--has enabled the commuter airlines, and commuter traffic, to attain growth rates that are double those of the rest of the air transport industry, while substantial prospects are opening up in all countries in which these aircraft are able to provide an effective solution to the problem of short-haul air transportation.

In this sector, the recent industrial agreement between the Aeritalia Company (of the IRI-Finmeccanica [Industrial Reconstruction Institute-Mechanical Engineering Finance Corporation] group) and AERCSPATIALE [National Industrial Aerospace

Company], the largest French aerospace group, marks the beginning of the development and production of an Italo-French commuter plane for the international market. The program for the ATR 42 (Regional Transport Aircraft 42) has been the object of collaboration between the two companies that was initiated in 1980 and led to the decision to merge their respective (and similar) projects--the AIT 230 [Aeritalia 230] and AS 35 [AEROSPATIALE 35]--which had long been under study. The agreement--which was concluded coincidentally with the annual American "convention" of the third-level airlines--emphasizes the objectives of collaboration within the framework of the European aviation industry: according to a memorandum from the Italian minister of industry, "the ATR 42 project is in response to the industrial policy directives recently laid down by the Italian Government in the program finalized for the aviation industry, which favors initiatives that are implemented through the medium of forms of international cooperation."

The basic model provides for 42 seats in four rows, with plans for subsequent versions (of 45 seats) and also for cargo models. The aircraft will have numerous components of advanced technology in respect to aerodynamics, cabin acoustics, materials, onboard equipment and motors (two new-generation 1800-horsepower turboprop engines). Its maximum weight at takeoff is 14,700 kilograms, and its cruising speed is more than 500 kilometers per hour. Moreover, the ATR 42 will require a relatively short runway (1,000 meters) and have a range of 1,300 kilometers: that is, it will be able to complete four flights of 185 kilometers without refueling.

As for other commuter aircraft, the Italo-French plane appears to be remarkably competitive, with 30 to 50 percent less fuel consumption. However, the interest in the joint Aeritalia-AEROSPATIALE project resides above all in world market demand, which is forecast at 2,500 aircraft of this type over the next 20 years, with potential sales for the ATR 42 of approximately one-third of the total demand. The auspicious response of the market to the new plane is, moreover, already borne out by numerous orders from various airlines, including the largest commuter airlines in the United States.

To manage the program, Aeritalia and AEROSPATIALE have provided for the formation of an "Economic Interest Group"--GIE--in accordance with a French legal formula that has proved to be particularly applicable to the management of joint programs. By joint decision, the agreement specifically entrusts the Italian company with the construction of the fuselage, fins and corresponding systems, and AEROSPATIALE with construction of the wing, other onboard equipment and the final assembly. On the Italian side, production of the aircraft will also involve the participation of the other enterprises of the sector.

The schedule for the ATR 42 calls for the prototype to be completed and make its initial flight in the summer of 1984.

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CSO: 3102/161

END

JPRS 80426

29 March 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 98

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JPRS 80426

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WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

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RESTRUCTURING OF CHEMICAL INDUSTRY PROPOSED

Paris INFORMATIONS CHIMIE in French Special Issue Jan 82 pp 14-20

[Speech by Marcel Bohy, head of the Chemistry Sector in the Commission for Industrial Policy of the Socialist Party]

[Text] Before I begin, I want to express my great pleasure at again meeting my friends at INFORMATIONS CHIMIE, whose initiative I believe to be entirely wise, albeit risky from some standpoints, as Pierre Peutey said a little while ago. I hope that we will succeed in accomplishing something effective today, and I think that INFORMATIONS CHIMIE, in whose beginnings I participated, should be able to continue to help us in this debate.

In rather rapidly disclosing, since the beginning of autumn, a plan for the furniture industry, and a little more recently one for the shoe industry, the government has swiftly demonstrated that it definitely intends to establish an industrial policy which will fulfill its major objectives for the direction of our economic activities.

You also know that during the Council of Ministers session held at the beginning of December, an extremely ambitious plan for the machine-tool industry was also presented to the government. I can tell you--and I don't know if the press has published it--that during that meeting, the President explicitly asked for the rapid formulation of other plans for other industrial sectors to which it would be important to bring the support of the state, and in the order of urgency he named the basic chemical industry.

In the Socialist Party, we have known for several years already that the large enterprises whose nationalization was stipulated in the Joint Program, would raise very specific and large problems.

That is why for several years, as is true for any political group, the specialized commissions of the party had begun to think about the consequences of this possible nationalization; as a participating member of the Economic Commission and of the Commission for Industrial Policy of the Socialist Party, I will thus tell you about the essential aspects of the considerations and proposals--for these are proposals and not plans, despite what some of my journalist friends have to say--that that we have formulated in anticipation of becoming in charge of our country's affairs.

To begin with, I will briefly review our major industrial policy objectives, as recently stated in Michel Rocard's interim plan. We will then see how these objectives must be implemented within our chemical industries.

I will not discuss again the reasons that have led us to believe that a significant and rapid reshaping of our chemical industry structures was necessary and desirable.

Mr Savostianoff has provided us with that information. Rather, I will come directly to the major principles which in our opinion should guide the work of those who will be responsible for thinking about and proposing to their supervising ministry, the restructuring which they deem desirable for achieving more efficiency.

Maybe I should state right away, and it is important to emphasize it, that it is clear in our minds--as Mr Savotianoff has stated--that a complete restructuring of our basic chemical industry is in no way a cure for all our ills.

However, it does seem to us to be a necessary, and even prerequisite condition, but certainly not a sufficient one, in order for our industry to obtain results as satisfactory as possible, at least for the intermediate future.

The interim plan contains four major industrial policy objectives:

The first, of a relatively circumstantial nature, is to ease the energy constraint.

The next two, which conversely are quite permanent, are to better control our domestic market and improve our international competitiveness.

And the last, which unfortunately threatens to be not circumstantial, but lasting, is to participate in improving our country's employment situation.

These are naturally general terms which apply to all economic activities. For a branch as large as ours, their implementation raises a certain number of problems.

We Have Played a Somewhat Innocent Game of Perfect Openness to the Outside

One of the most important goals is the control of the domestic market. You know that within the Socialist Party there is rather general talk of recapturing the domestic market. It is quite clear in our mind that we cannot achieve this by curling up in a ball.

That would mean closing our borders in the literal sense of the word; but we are sufficiently realistic and sane to note that all shadings are possible behind the assertion that the borders are open to international exchanges. All we need for this, is to observe the behavior of some nations, whether industrialized or emerging.

We believe, and we are not the only ones, that in some cases and for some 15 years, we have have played an extremely honest--and I would say somewhat innocent--game of full openness toward the outside. We note, and although I will not go into details everyone will understand what I mean, that even our most powerful neighbors have found the opportunity to introduce here and there the stresses which they deemed necessary--which were not in any way operations of a brutal nature--to protect and keep alive a number of activities which they felt were necessary for the the balance of their economies.

We believe that in a number of cases it would be desirable for us to adopt the same type of attitude, but that would not be a long term solution. Mr Savostianoff has said it--and when you are a chemist yourself it is hard to acknowledge it for your own country's chemical industry--but we believe that the quality of our industry is not excellent, and if its domestic market is poorly controlled, it is precisely because the quality of its products is not entirely what it should be.

We therefore believe that a better control, and maybe a certain recapture of our domestic market, will ensue from an improvement in the quality of that which as French chemists, we make or discover. This is naturally a long range objective, and everyone in this room knows it as well as I do.

One Idea Which Was Born Before 10 May

While I don't want to dwell on the reasons which argue in favor of restructuring the chemical industry in France, I still want to point out that since the beginning of the 1960's, the government in power at that time had asked itself the question of whether it would not be desirable, for economic efficiency, that the chemical industry in France adopt different and if possible, better structures than the ones it had at the time.

To this end, the government had asked the Inspector for Finances, Bernard Clappier, who since then has become Governor of Banque de France, to present a report on the matter. Many of us know and have had occasion to read this Clappier Report. I don't know if this report will have been premonitory, but in any case we will all know it in a few months, or in one or two years.

Even at that time, the report described with great clarity, almost brutally, the strengths and weaknesses of our industry, and the means which Clappier would have used to change structures so the industry would become more efficient and competitive. This, let me remind you, was 12 years before the oil crisis.

The report stated that the French industry could usefully be redistributed into two enterprises, around two axes.

As you can see, the restructuring idea was not conceived yesterday, or more specifically, not on 10 May. The situation has of course changed since then, and among the questions that must be asked in order to carry out a restructuring operation, it is obvious that energy dependence has assumed an importance which it did not have in 1963.

Assuming that it would be desirable to reshape our chemical industry into new structures, these could be--maybe not copied from those of our foreign competitors--but inspired by the efficiency principles that can be discerned behind the results and appearances of these enterprises. I know that we do not like to refer to foreign models, but in the case of the chemical industry, we are compelled to acknowledge that our market is not a national one. In the cement industry for instance, where international trade is low, we can think strictly in terms of a national market; this is not possible for the chemical industry. Under these conditions, it is clear that our chemical industry activities should not compete with one another, but rather with their counterparts in surrounding countries. In this domain--and I know that this is also questioned very closely--some American analysts such as the Boston Consulting Group, have for some time already made some

findings from which they have drawn the body of a doctrine (they would probably not like the expression) that is quite illuminating in understanding the strategy and results of the large international groups. Neither do I want to go into the details of another analysis by another consultant, unfortunately an American one as well, about the types of activities in chemical industries, and about the Kline proposition, which explains very well the major activities of heavy chemistry, fine chemistry, and parachemistry. The latter a less capitalistic one, referring directly to final consumption, with more regular and generally higher profit ratios, but naturally concerning smaller volumes than those of the large basic industries.

Raze the Structures and Move Fast

We can now ask ourselves a number of questions about the principles which will guide the selection of a possible solution; there are not too many of them, but the outlines of this solution obviously can and must be discussed among experts.

What then are the principles, the big questions which must be examined before undertaking this restructuring? Before answering, we must establish two fundamental prerequisites.

Before engaging into negotiations, the first prerequisite which we believe to be fundamental is that all the enterprises concerned come to the discussion table and openly disclose their structures.

An attitude that amounts to saying "restructuring is well and good for the others, but it doesn't concern me," can only lead to failure in this endeavor.

The second prerequisite is the calendar. We believe that we must progress rapidly and with determination; those who think that we have all the time in the world either are not aware of the difficulties, of the nature of the difficulties in the industry, or have not considered the matter and want more time to think about it. Unfortunately, the closing of balance sheets at year's end does not brook delays. Time passes inexorably, and Mr Savostianoff has pointed out the nature of that burden.

In order not to put the cart before the horses, we must first analyze the industrial aspect, that is begin--and that is not our usual custom--by doing chemistry. This is a chemist speaking, and if you will pardon me and pardon my personal bias in this matter, we must first do chemistry, and then, and only then, ask the legislators and financiers to provide simple and clear legal frameworks for the organizations that will have first of all been defined in terms of industrial criteria.

And finally, as an equally fundamental matter, the financial structure of the groups that will result from this work will have to be healthy from its inception.

We know that there are at least three reasons for the mediocre results of our chemical enterprises in France: one is structures, which we are discussing today; the other certainly is the quality of the product lines; and obviously, there are the balance sheets of these enterprises.

We should undoubtedly recognize that the two latter reasons are not independent of one another: our balance sheets have gradually deteriorated simply because our product lines were not all that they should have been. We note that for other enterprises, unfortunately foreign ones as a rule, balance sheets did not deteriorate as they did here, wherever the quality of the product lines was demonstrably excellent.

The Goal is Not Large Enterprises but High Performance Ones

These prerequisites having been stipulated, what are the big questions that can arise during the negotiation?

First of all, the number of enterprises: the restructuring concerns on one hand organizations that have already been nationalized, and on the other, those that are nationalizable. We also have large chemical organizations within groups whose main activities are not chemistry, and while everyone is thinking about PUK, there are also the oil companies, and the Enteprise Miniere et Chimique.

The question then is to know which activities will be effectively involved in this restructuring. This is a question which we will perhaps touch upon in our discussion.

The question is to determine into how many organizations all these activities should be regrouped. The answer could be very brutal: in terms of business turnover, the organization which in all likelihood will be nationalized as early as the beginning of next year, will be of the same order of magnitude as a major German company, meaning approximately 70 billion francs.

We might consider--and some have said as much--that we could create a single chemical enterprise of the ICI type in France.

Others believe, and this is the ultimate conclusion of our own proposal, that a single enterprise is not necessary in economic terms, and that it presents a good number of drawbacks--I might say--in sociological terms.

First of all, size is not the fundamental factor; as we all know, the goal is not to have large enterprises, the goal is to have high performance ones. It is clear that by gathering up everything we now have, and making no changes, we would create a monster which would be invertebrate.

On the other hand, to maintain the plurality of small enterprises as they exist today, would only perpetuate duplicate jobs and activities, as well as sterile competition in many cases; we will return to this point later.

This of course leaves the middle course: two or three groups. Analysis shows that a structure containing two groups, each of the order of 30 to 35 billion francs in turnover, would be a possible solution; its advantage would not be to maintain competition between two French groups, which we believe would be a mistake in this intermediary field, but rather to maintain a sort of competitiveness or emulation.

A single enterprise requires a single type of management, while two enterprises make it possible to have two management styles, in social, economic, as well as technologic terms. Obviously, the financial constraints are the same, but that is not all there is to it. For a certain number of activities in the enterprise, we believe that emulation, the possibility for the state to compare efficiencies, is a factor not to be overlooked.

What structure should these groups have?

Two opinions have come to light in recent years. On several occasions, some have spoken of creating a number of single-product enterprises; I was going to say Engrais de France, but that would be naming an enterprise that has already existed; on the other hand, why not Pharmacie de France, Plastiques de France, and so on.

A Strategy for a Balanced Product Line

If on the other hand we refer to the principles of the Boston Consulting Group or of Kline, which I mentioned earlier, and if we analyze the large international chemical groups which are reasonably successful, we find that there aren't a whole lot of possible strategies for establishing the structure of our national groups; indeed, there are two possible major strategies for an enterprise of national size. The first consists in having a product catalog, a balanced portfolio of activities in every sense of the term, including products of diverse economic or technical nature, stable as well as fluctuating products, and basic products as well as consumer products. To whatever extent possible, this balance must also be reflected in geographic terms.

Today, many enterprises such as Dow or the big German firms have two or three basic axes of activity, one in Europe, another in the United States, and the third distributed among the other OECD countries.

The economic characteristics of these various markets are not alike; unquestionably, the balancing effect is there to secure the position of these enterprises operating on the international market. However, there are major exceptions to this rule, in the form of enterprises which do not appear to have balanced product lines, although they often claim that they are striving for equilibrium.

Some of these are involved only in fine chemistry or parachemistry. Others are essentially in heavy chemistry (as in the case of Dow). But we also know that in order to succeed, these enterprises must be of international size; it is obvious that in this case, being the world leader provides key advantages, and the possession of a true distribution, of a true geographic balance of activities, provides a stability that we see reflected in their results.

But it would be difficult for the French chemical industry to use this second strategy today. The French petrochemical industry does not have the means, no matter how we reorganize it, to use a world strategy of the Dow type. Neither do French pharmaceuticals have the means to use world strategy of the Ciba-Ceigy type. We can discuss it, but in any case this is our first conclusion.

On the other hand, we believe that a strategy based on a balanced product line, which is the one we see generally being used by the large German firms, is accessible in the immediate future to the two enterprises which would result from our restructuring. Of course we must add that the chemical industry is strongly characterized by the product specialty concept. This very fashionable notion can be found in many industrial sectors, such as lumber, paper, cellulose, cardboard, and others.

This concept becomes particularly important in the chemical industry, because the specialties of this industry have the attribute of being deeply interconnected.

This raises the delicate question of division of activities among the two groups. Must each of the two groups make all the products? The fact is that French chemistry covers a broad range of all chemical products; or, on the contrary, must each of the groups be composed of a small number of specialties compatible with one another, mindful of the interconnections I mentioned, it being understood that other specialties would be entirely lacking from these groups.

Of course, the real difficulties begin when we move to practical applications because each one of us then becomes directly concerned.

Nevertheless, there remains the question of which specialties will be grouped together, and which will not.

We believe that the large petrochemical branch does not have to be gathered along a single axis. The magnitude and quality of the French petrochemical industry, its integration into downstream lines, and its geographic structure are assets which must be taken into consideration.

The two groups could thus each have a petrochemical basis; our petrochemical industry as a whole is not based on extraction, or completely blocked geographically, or gathered in a single organization.

On the other hand, we feel that a very large chemical industry such as the halogen branch, can be perfectly well reorganized in only one of the two groups. This is a branch of chemistry--and those who are familiar with it know it better than I do—in which interconnections are quite remarkable, remarkable for the chemist's mind, and fundamental to the economy of the activity.

In terms of plastics, the concept of specialties, geographic considerations, and the current situations of the various groups, lead us to think that it is not necessary for one organization to make all the plastics and the other none. Some specialties can be naturally detached; for instance, the group which has a petrochemical base and a mastery of halogens, can naturally produce polymers which are directly connected to the chemistry of halogens. Conversely, the other group, which would have its own petrochemical base, could devote itself more specifically to the chemistry of polyolefins and that of styrenes.

This is one possible choice, and not the only one.

In the area of fertilizers, I would say that the question is threefold: raw materials, production, and distribution.

I will not delve on raw materials today. We might come back to them in the discussion about the price and control of raw materials.

But for production--and this is only a proposal and maybe a basis for discussions so that specialists may state their positions and select or tear the proposal apart--we believe that one of the groups could devote itself to the production of phosphate and potassium fertilizers, while the other group would work on nitrogen fertilizers.

Why? You know very well that I refuse to name any one French enterprise, because as things stand now we can already find a preponderance of phosphate and potassium fertilizers in some groups, and a majority of nitrogen ones in others. But the group in which we feel it would be desirable to maintain the bulk of nitrogen fertilizer production, is precisely the group which, lacking the halogens, would be responsible for synthetic gas chemistry, a chemistry which naturally involves ammonia and secondarily, methanol.

What is the purpose of fertilizer distribution? This is a question which the French have frequently asked themselves, and which has given the chemical industry many problems for years.

Our feeling is that the distribution of these fertilizers can be left to the chemical enterprises concerned, but that an independent organization could also be created, to receive from the manufacturing companies, either processed fertilizers or the major raw materials.

In this connection, I would simply like to point out that in recent years we have attempted to reduce the number of our producers. Nevertheless, the French fertilizer market has steadily deteriorated in terms of the market shares controlled by national producers.

This makes it all the easier for me to say that under these circumstances we must stop the current trend, or even proceed to recapture our domestic market to some degree.

The preceding administration considered it quite desirable to open the French fertilizer market to importation, and when figures were requested, some officials estimated, as we do, that for France to import 20 percent of its nitrogen appears to be a quite normal or even desirable state of affairs.

The question of course remains, although it had not been raised, as to the sources of this nitrogen. Should it come from the rest of the Common Market? Should it come from the developing nations? The question remains open.

As Mr Savostianoff mentioned earlier, it is true that there has been much discussion about relocation. Perhaps I should have presented this prerequisite. Should our chemical industry remain on our national soil?

In our view, the basic prerequisite is that our chemical industry is on the whole, essential to our short term or intermediate economic balance. Therefore the industry must remain in this country. To indiscriminately open our borders to importation is out of the question.

As far back as 1967, I was told by one of our major industrialists: "My friend, we will not build any new phosphoric acid plants; when consumption increases, we will turn to importation."

I find that in 1981, we still, and more than ever, continue to make phosphoric acid in Western Europe, and you know as well as I do that Morocco has more phosphorus pentoxide manufactured in Europe than it produces on its own territory.

These principles having been stated and these structures sketched out, I would now like to say a few words on two aspects which I believe to be very important and which concern research and investments.

Most of the Major Progress is Achieved in the Major Enterprises

Finally, although my address is essentially industrial and economic rather than financial or social--at least in theory--I would still like to conclude with a few words on these aspects, which are not always without importance in our daily life.

First of all, concerning research, its enterprises will immediately have product lines of mediocre quality, as I mentioned earlier. In saying this I am not speaking as a member of the Commission for Industrial Policy, of the Socialist Party, nor as an official of a French chemical enterprise; it is unfortunately the slumbering journalist in me, who is expressing himself.

It is clear that restructuring will not provide an immediate solution to this problem, but we think that it will put us in an appropriate position to gradually remedy this weakness.

Twenty or thirty years ago, people worried about the gigantic size of chemical enterprises throughout the world. Studies had even been published, brilliantly demonstrating that major progress and innovation in chemistry came from small enterprises and not from the giants.

We are now forced to acknowledge that this has been a mistaken notion for a quarter of a century; "small is beautiful" may be true in some fields, but not in chemistry.

You know as well as I do that the most significant progress today is being made in the large enterprises.

It is obvious that the inadequate size of our enterprises has entailed regrettable duplications. Our research efforts have led to the assignment of teams which work 100 km apart and ignore each other, and to the allocation of sums of money which separately were insufficient to assure success, while the results would probably have been much better if these teams had worked together with a coherent budget.

What this means, is that if we do not succeed in the large enterprises, the end result will be bad.

Ultimately, we think that if men are motivated by profit, they are not motivated by profit alone, and we believe that by endowing more efficient, more rational, and more logical structures, we will achieve greater efficiency even if only in the long run.

There is No Question of Adding Facilities Which Would Be Misused

I would like to make two or three remarks concerning investments, starting with industry as a whole, and then returning to the more specific cases in the chemical industry.

In the Commission for Industrial Policy, we have taken pains to analyze as thoroughly as possible, the problem of industrial investments in France, and we made the following discovery: each year, the total investment of the French nation is 450 billion. One third of these 450 billion, or 150 billion, go to housing. Another third goes to energy, transportation, agriculture, and all the major national infrastructures; in the last 150 billion is to be found the whole remaining balance of economic activity: services, trade, business, distribution, and obviously, industry in the strict sense of the word (that is except for building and public works on one hand, and except the food industry on the other).

Industry in the strict sense of the word represents roughly one-half of the 150 billion. And you would need an electron microscope to detect the chemical industry itself within this sub-sub-sub-total!

Seventy five billion for the industry as a whole: this still implies that a certain growth in industrial investment, a voluntarism--the term is awful--is surely not unreasonable, when you think of the powerful momentum that can be engendered by the industrial investment that produces goods (there is good reason for using the word goods to describe material things). Not that services and distribution are bad, but industry is what creates material goods. Investing in the production of material goods therefore seems desirable to us, especially when you notice, as in recent years, that investments in trade and services have continued to grow, while industrial investment decreased.

In 1972, more was being invested in industry than in goods and services; in 1979, for the first time we have invested more in the business sector than in our industry.

Naturally, this is a fundamental trend. But nothwithstanding it, when we examine our industrial strength we can worry and wonder whether we have not entered too soon into what we might call the post-industrial era.

To return to our chemical industry, the question of investment was just mentioned by Mr Savostianoff, who said that it should be approached with care. Of course, it's true that it seems somewhat insane to speak of investment in an industry which is crying every day about its overstocks.

The answer is clear and simple, and it pleases me to give it here, among people who know what they are doing. We have a very large industrial establishment. There is no question of adding facilities which would be misused. But within these large organizations, we know perfectly well that the quality of the investment, that the quality of the equipment, and that the quality of the units, is not always what it should be, what it could be.

Then, from this position, if an investment effort is to be made, and we would like to see it made, it seems evident to us that it will have to be made to improve our industrial facilities.

In fine chemistry, in parachemisty, this is naturally not independent of investment decisions, of the achievements of units which manufacture new products.

To conclude, I will say a few words about financial and social aspects.

In the financial area, I will recapitulate what I said earlier. We have to be provided with sound financial structures so that the government will have the elements which will allow it to judge and form correct comparisons with the international situation. If the government wants to carry out an industrial policy, it is faced with two options: it can either underwrite structures with bad financial structures (after all, the collectives are there for that, even though we wish that they were there for something else), or provide them with sound financial structures and thus be in a position to control the eventual discrepancies, the slackness which could form in the management of these enterprises.

Finally, it is clear that these enterprises must be managed by competent and combative men, and that we must remain fundamentally competitive with those around us. If the French were to spend three times more money for chemistry than their competitors, they could not devote the money to another activity, and it would therefore be a loss elsewhere.

We Continue to Believe That the Supervisory Council and Board of Directors System is Preferable

I would like to dwell a little longer on the social aspect of this problem.

I might touch upon two facets. I first should remind you--for this was not the position of the Socialist Party but that of our Commission for Industrial Policy--that we have felt that the legal structure of the groups as a result of nationalization ought to be a structure of the Law of 1966 type, that is, that we supported companies with supervisory councils and board of directors.

We felt, and still feel that for nationalized companies the supervisory council and board of directors system could be an efficient means for ensuring the independence of company heads with respect to day-to-day management of their enterprises.

We also looked around us: in the major German chemical enterprises, the supervisory council is composed equally of representatives of capital holders and of personnel representatives. We felt that this solution would be be a quite effective way, free of troublesome ambiguities, to give the work force in enterprises a very tangible grasp on management and on decision-making in matters which concern it.

As you know, our views gained no following, since first of all or party felt it preferable to retain traditional administrative council structures, with a president and general manager, and secondly, that the administative council should be composed of three thirds: one representing shareholders, another the personnel, and the last representing the customers of the enterprise involved.

It is not up to me to judge the option that was made, but I felt that there was nothing wrong with sharing our conclusions with you.

I would still add that the terms of nationalization are not ad vitam aeternam, and changes are possible. Time will show what changes occur in this field.

There Must a Temporary Employment Freeze

In more practical terms for the chemical industry, we noted one last but important fact concerning the eventual adoption of this restructuring.

In order for this major reform to be accepted by all, and especially by the mass of concerned workers, rather than solely by satisfied officials, company heads, or general managers of enterprises, it is vital that this reform not be accompanied by a wave of firings, reassignments, and retirement of personnel, in all the various organizations, in other words everywhere at once.

We believe that this is a reasonable position even if it might appear like demagoguery, which it is not in our view, because we believe that a halt is needed. Some call it a moratorium, a term which I don't like very much, because in social terms we would like to see profound reforms. But as we see it, this halt is of a strictly temporary nature.

We justify it as follows: in the short term, restructuring can bring about certain improvements in the results of the enterprises involved. Not that we expect miracles. But we think that a few more percentages in efficiency can be obtained in the short term as a result of this restructuring, in terms of a more rational use of means of production, transportation, and even business activities.

We therefore think that while it won't solve everything, this productivity increase can at first, temporarily as a transitional measure, be used to freeze employment, with the exception of the implementation, but in perfect coordination with all interested parties, namely the workers involved in a given closely timed operation about which all are in agreement.

If maintained for a long time, this pause can only lead to a degradation of results in our enterprises. The advantages derived from research and from investments in more efficient tooling, could in no case hide the problems of too many or outdated shops, and of an excessive number of personnel hired in periods of optimism.

But we must be realistic. When the chemical industry was making a lot of money, it hired a lot of people and paid them better than many other industrial branches.

Now that the lean years are stretching out, we will have no other choice than to persevere in our efforts in this field. We therefore suggest that the leaders of the resulting enterprises be appointed with an imperative mandate to rapidly resume the efforts needed to rationalize the means of industrial production, and to organize employment.

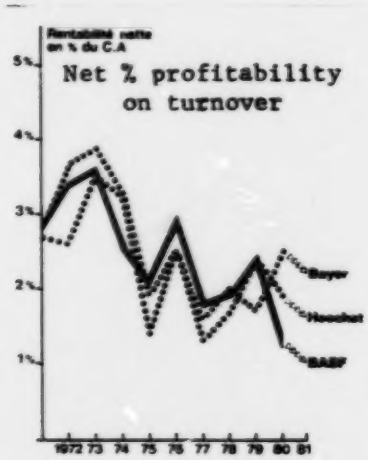
I know that in saying this I am not talking against employment, and that I am not saying that the chemical industry will contribute to the maintenance of employment. Let us be reasonable. The French nation is a large complex; withdrawing 1000 people from an enterprise, provides the enterprise with a short term cash flow of 50 million. The enterprise ends up with 150 million cash flow instead of 100 million, but the French state must continue to feed these 1000 people. There are two possibilities: either it feeds them very badly, and that's scandalous, or it feeds them well, and those 50 million have to be found somewhere in any case.

If the effort must be made to put our chemical industry in order, it is so that its competitiveness status will be as clear as possible in the eyes the government who will be in charge of it and intends to direct industrial policy.

This being said, it is clear that we think that liberal capitalist reasoning applied by itself to an enterprise considered apart rather than within the context of the French nation, does not strike us as the best of solutions.

I don't know if a pause will occur where the chenical industry is concerned; I don't wish for it and I hope to have given you the reasons for my deep conviction against it.

Concerning the German Model



One may wonder to what extent the balanced portfolio strategy can still be considered as a development model for chemical group of world caliber. One thing is certain: for 10 years, the three major German firms have faced a gradual but irresistible drop in profits (see figure). Whence a clear tendency to readjust their activities in favor of sectors with higher value-added, such as pharmaceuticals and phytopharmaceuticals (Hoechst and Bayer), photography (Bayer), and mass consumption products, particularly magnetic media (BASF).

On the other hand, upstream integration is being differently analyzed: Hoechst and Bayer, no longer involved downstream, don't seem to be interested; conversely, BASF (producer of hydrocarbons and refiner on German soil) seems anxious to develop its resources and is participating in exploration and exploitation through its Wintershall subsidiary. In particular, the group belongs to the consortium which is expected to exploit the enormous methane deposit at N-W Dome in Qatar.

Finally, concerning geographic diversification, the three German firms have very similar policies: massive implantation in the United States, significant activity in Japan, and rapid expansion in rapidly growing markets (notably South America).

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DEBATE CONTINUES OVER FUTURE OF 150-SEAT AIRLINER

International Strategies

Paris AVIATION MAGAZINE INTERNATIONAL in French 1-14 Mar 82 p 13

[Article by Roger Cabiac]

[Text] The positions being taken by aircraft manufacturers involved in the "super-efficient" 150-seat commercial transport program are so different and often contradictory that the careful observer tends to become perplexed at the way this program is evolving.

McDonnell Douglas and Fokker attribute the failure of their negotiations on the MDF-100 project to their joint determination that there is neither a market nor an engine for such an aircraft.

Boeing does not appear to have a very clear position on the matter. Airbus Industrie, on the other hand, is convinced there is a market and hopes that an engine manufacturer or group of manufacturers will very soon hold a similar view.

Such experienced aircraft manufacturers as McDonnell Douglas, Fokker, Boeing, and Airbus Industrie are all capable of detecting the existence, scope, and limits of a potential market for a commercial transport. Consequently the only logical explanation for their differing views apparently lies in the impact of their respective strategies.

Hence the position taken by McDonnell Douglas and Fokker must no doubt be interpreted as their way of justifying the failure of their negotiations.

Hence Boeing's vacillating attitude must be viewed as indicative of the desire of that company's management to preserve the marketing strength of its current programs--737, 727, and 757 families--while at the same time giving itself, with its B 7-7 project, the means of intimidating or, if need be, meeting the competition.

Airbus Industrie obviously does not have the same concerns as Boeing. The European consortium has no 150-passenger aircraft in its range of transport production programs. It is logical, therefore, for it to wish to fill this

gap with the A320. But the A320 program is still having difficulties. With the exception of Air France, not one of the major airlines in Airbus Industrie's member countries has indicated it is prepared to buy the A320. Hence to launch this program, Airbus Industrie hopes to receive a favorable decision from a major American carrier, Delta Air Lines, a decision that would prompt an engine manufacturer or group of manufacturers to develop the "super-efficient" engine enabling the aircraft to achieve desired performance standards by late 1986.

Yet no powerplant manufacturer currently seems ready to commit itself to such an engine program and, a fortiori, to guarantee certification by 1986 of an aircraft powered by such an engine. And therein lies the A320's basic problem.

Assuming that air transportation expands at a reasonable rate, the A320's commercial success depends on its being available by 1986, because its performance characteristics would then by superior to those of its competitors. But Airbus Industrie conditions this aircraft's performance on use of a jet engine that will most likely not be available by the 1986 target date.

On the other hand, if the decision were made to delay introduction of the A320 much beyond 1987, pending development of the desired all-new engine, then the Boeing B 7-7 is liable to make the A320's airframe technology obsolete.

Lastly, there is still the question of what Fokker plans to do in the commercial transport field following cancellation of the MDF-100 development agreement. Will the Dutch firm join with Boeing? Or with Airbus Industrie? Or will it decide to go it alone by concentrating its efforts on modernizing its F-27 and F-28? In any event, modernization of the F-27, entailing its reengining, would inevitably cause some concern among officials of the French-Italian ATR-42 [twin-turboprop commuter] consortium.

Failure of MDF-100

Paris AVIATION MAGAZINE INTERNATIONAL in French 1-14 Mar 82 p 19

[Article by PS: "Fokker Seeking New Commercial Transport Goals"]

[Text] On 5 February, with startling suddenness, McDonnell Douglas and Fokker released a joint and somewhat terse statement announcing termination of their agreement on joint development of a 150-seat short-to-medium-haul transport, the MDF-100. A few days earlier, a spokesman for the Dutch manufacturer had still discussed the project's prospects in relatively optimistic terms. Theoretically at least, this termination has left only two competitors vying for the 150-seat transport market and suddenly compelled Fokker to view the future of its commercial transport activities in different terms.

Some 9 months after signing a cooperation agreement that had caused quite a stir, at a time when negotiations with the Japanese aircraft industry seemed close to fruition, the MDF-100 has disappeared from a cluttered scene whose

aspect had already frequently changed since mid-1981. Sanford McDonnell and Frans Swarttouw said cancellation of their joint venture was due mainly to the depressed commercial aircraft market, the current airline recession having seriously dimmed the outlook for orders of new aircraft.

No reference was made, however, to the engine problems plaguing the different airframe manufacturers involved who estimate--or estimated--with more or less optimism and conviction that the 150-seat transport will constitute a very large commercial market by 1986 or 1988. While Fokker simply announced it would now concentrate all its funds on programs such as the F-27 and F-28 transports, McDonnell Douglas very clearly stated it was still interested in developing this type of aircraft and would continue to discuss this possibility with potential partners and would likewise continue its development studies to this end. Meanwhile, the Long Beach design offices will examine the possibilities offered by new derivatives of the DC-9 and DC-10.

Waiting is Expensive

Beyond the wording of the official McDonnell-Fokker statement, there are several possible underlying reasons for this somewhat hasty cancellation. It is true that the market is depressed, that a very large number of airlines are strapped for funds, and that hopes for an upturn are taking an unusually long time to materialize. Moreover, it is unlikely that any basic technical disagreement had divided the Dutch and Californian design teams.

On the other hand, although the MDF-100 program--like the A320 and B 7-7 programs--did correspond to a real long-range market, it had certainly begun to slip because launch conditions could no longer be met in the relatively near future. In the absence of an adequate engine, customers are reluctant to cross the Rubicon without further delay. In addition to the airlines' cash-flow problems, some observers also, paradoxically, point to the impact of lower-than-expected aviation fuel prices. As a result, the fuel savings to be obtained by using more fuel-efficient aircraft have become less attractive than inordinately pessimistic projections had initially led airlines to believe.

Even though all parties involved do not share this view, it does appear that McDonnel Douglas and Fokker felt they would have to wait too long before being able to launch the MDF-100. This slippage entailed expenditures that were becoming increasingly difficult to justify, especially by the American party. Even though Fokker was spending its own funds on the project, it could, in fact, count on the Dutch government's willingness to give it financial support, a factor obviously conducive to making it more patient than McDonnell Douglas.

If there was any disagreement between the two partners, it undoubtedly centered on this financial aspect. Each of the two former partners has now withdrawn to its former positions, having acquired additional experience, of course, but without having any possibilities or renewing their partnership. This unpleasant but not thereby alarming situation does have special significance for Fokker, however.

Return To Europe?

Under Frans Swarttouw's dynamic leadership, Fokker had sought to reassert its claims as a full-fledged commercial transport manufacturer capable of assuming a leading role above and beyond its well-established F-27 Friendship and F-28 Fellowship programs. From the Super F-28 to the F-29 first of all, and then with the MDF-100 Atlantic project, plus hopes of a partnership with Japan, Fokker has traveled a long road, but this road leads nowhere.

What will Fokker do? When failure of the MDF-100 venture appeared likely, the company had automatically thought of replacing the F-27 with an advanced-technology aircraft tentatively called the FXX. This plan will now probably be revived and updated, but without being fully implemented before the late 1980's. Before then, the Dutch manufacturer will have to reassess its attitude toward the European aircraft industry in general and the Airbus Industrie consortium in particular.

Toulouse [Airbus Industrie] had made overtures with respect to the F-29. This offer did seem advantageous, of course, but Fokker had quite obviously deemed it somewhat too restrictive in the light of the company's clearly reaffirmed desire for independence, its insistence on being the prime contractor or at the very least, as with McDonnell Douglas, a truly equal partner. All technical and commercial considerations aside, had Fokker's management sets its sights too high? This previously evaded question now awaits a clear answer.

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ALFA, FIAT PLAN JOINT PROJECT FOR SUPER FUEL-EFFICIENT CAR

Milan IL GIORNO in Italian 11 Feb 82 pp 1, 4

[Article by Luigi dell'Aglio: "Within 10 Years, 33 Kilometers on 1 Liter"]

[Text] In order to invent the most economical utility passenger car, Alfa and the Turin company [FIAT] must be able to count immediately on reservations by Italians and on state aid with higher taxes on traditional automobiles. A saving of 1 trillion lire in oil is anticipated in the near future.

FINMECCANICA [Mechanical Engineering Finance Company], acting for Alfa Romeo and FIAT, has submitted a joint plan for producing the Alfiat, the automobile of the near future that will travel 30 to 35 kilometers on 1 liter. The series of final plans is scheduled for 1990, but the first vehicles capable of traveling 25 kilometers on 1 liter of gasoline will come out already within 2 or 3 years. We are confronted by a real revolution in the field of the automobile, a revolution that, from a certain aspect, will be imposed by the state, which, in order to compel Italians to save gasoline (1 trillion lire by 1985 becoming 6.3 trillion by 1990 are mentioned), will tax normal vehicles all the more heavily, the more they consume.

FIAT and Alfa have said clearly that, in order to be able to make the plan a reality, they must be able to count right now on advance orders by Italians and on a contribution by the state. Finally, it is difficult to speak of prices of the Alfiat, also because, at first, it will be a question of modifications to the engines of existing automobiles more than of an out-and-out new automobile.

Rome, 11 February--The Alfiat is about to be born, the automobile conceived by FIAT and Alfa that drinks less gasoline. The first version will see the light of day by 1985 and will make it possible to save on the order of 15 to 20 percent fuel. The second version will come out by 1990 and will reduce consumption to half. In practice, a "sober" utility passenger car will travel 30 to 33 kilometers on 1 liter of gasoline. An automobile with medium-large displacement will consume as much as a current utility passenger car. In order to win the energy challenge, private and public industry not only

will no longer wage war against each other, but will walk arm-in-arm. The plan for the automobile of the (near) future, submitted by the president of FIAT, Cesare Romiti, and by the president of FINMECCANICA, Franco Viezzoli, will also benefit the nation's economy. By 1990, Italy will be able to import 19 million fewer metric tons of oil, saving 6.3 trillion lire. According to estimates, we would save over 1 trillion a year, starting in 1985.

It is not a question of something in the distant future. The two automobile companies have committed themselves to showing us, within the next 3 years, the first tangible signs of this automobile revolution. Small vehicles will reduce consumption by 15 percent; medium-large ones, by 20 to 25 percent. The Alfiat, the ideal automobile symbolizing the era of energy saving, will compete with the "economical" cars that American and Japanese companies are preparing to bring out.

In order to double the performance of four-wheeled cars, FIAT and Alfa intend to make automobiles more aerodynamic, lighter, with an engine that will "burn" less. But they have spoken clearly: the effort to "invent" an automobiles that will travel double the distance traveled by the present-day automobile, with the same fuel consumption, can be supported only under certain conditions. First of all, the state should not stand idly by, while this sophisticated technological revolution takes place. Italian automobile owners whould be induced, one way or another, to sell their old automobiles that consume more and to reserve immediately the new "jewels of technology" as soon as they come on the market. Because energy saving is a public duty, in addition to being a private interest. FIAT and Alfa are suggesting to the government that it have automobile taxes paid in inverse order in proportion to the gasoline consumption. The more gasoline consumed by an automobile, the more taxes it pays. In addition, the purchaser of a "sober" automobile will benefit from special tax deductions, aside from facilitated loans. FIAT and Alfa regret that Italian automobile owners are the ones most reluctant to turn in their old cars. In this country, automobiles over 5 years old form 63 percent of all automobiles in the nation. In the other EEC countries, they form much less than half.

FIAT and Alfa are convinced that a good part of the energy problem would be solved in this way. Once an automobile has been designed that will "drink" as little as possible, the only sector in which oil is truly indispensable will be improved. (An automobile cannot, in fact, run on solar energy and, with regard to electricity, it can only operate trolley cars and trolley buses). The rest of the crude oil goes for house heating and especially for producing electricity. But the energy plan provides that soon other sources (solar and nuclear) will be used for these two purposes. Obviously, the automobile industry is asking for money, while it offers this delight. The Alfiat project will require investments in research amounting to 1 to 1.2 trillion lire. The two companies answer the objection that it is not easy to find this amount at present by pointing out that the American automobile industry will need $15 billion, the equivalent of 18 trillion lire, to reconvert to automobiles with low fuel consumption. The plan does not say how much the car of the future will cost until the experts know it. But it is likely that it will cost a little more than today's car, although the saving in gasoline will, at any rate, make this operation advantageous.

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CSO: 3102/155

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JPRS 80536

9 April 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 99

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JPRS 80536

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WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

No. 99

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BIOTECHNOLOGY

HEAD OF EUROPEAN MOLECULAR BIOLOGY LABORATORY INTERVIEWED

Stockholm NY TEKNIK in Swedish 28 Jan 82 pp 36-37

/Interview by Erik Mellgren: "The Genetic Researcher Who Gets a Top Job"/

/Text/ As of 1 April Lennart Philipson--professor of microbiology at Uppsala--becomes the new head of the large European Molecular Biology Laboratory, EMBL, in Heidelberg.

He received his doctorate of medicine at Uppsala in 1958 and did research at Rockefeller University in the United States between 1959 and 1961.

In the mid-1960's he worked in a cell biology group and helped establish the work at the Wallenberg Laboratory in Uppsala. In 1967 he became head of the laboratory and in 1968 the first professor of scientific microbiology at Uppsala.

Since then he has participated in moving the department to new facilities at the large biomedical research center, completed in 1976, in Uppsala.

In the photo he is seen at the center beside Bror Marklund's sculpture "The DNA Molecule" /photo not included/.

"I think it should be regarded as an honor for Sweden that a Swede is offered this position."

Those are the words of Lennart Philipson, professor of microbiology in Uppsala. As of 1 April he will become the new head of the large European Molecular Biology Laboratory in Heidelberg.

One way of describing molecular biology is that it is an area which has decisive importance for the new genetic technique, a technique which by means of so-called hybrid DNA can, for example, get bacteria to produce human hormones.

But Lennart Philipson's definition is different. He speaks of molecular biology less as a subject than as a philosophical approach within biology, "an extreme reductionism."

"It is one of the extremes in biology today, dealing with the smallest details in the processes of life."

"The other extreme is ecology, which attempts to create an integrated picture of large biological systems in which the whole is more important than the parts."

Molecular biology today exists in the boundary region between classical biochemistry and microbiology. At the same time its development has been advanced by modern physics.

Among the precursors are, for example, William and Lawrence Bragg, father and son, who shared the 1915 Nobel Prize in physics. They established X-ray crystallography, which has made it possible to reveal the structure of many biologically essential substances, for example DNA, the giant molecule of the germ plasm, which contains the code for the structure of living organisms.

Today, much of the interest in molecular biology is focused on the hybrid DNA technique (recombinant DNA is an alternative term), both as a basis for new industrial applications and as a tool for basic research.

Controversial

But it has also been a controversial area of research. When the technique was developed certain researchers feared that it could involve previously unknown risks, that one could, for example, create new disease-carrying organisms.

In a famous 1974 letter Paul Berg, among others, who later got the Nobel Prize for his hybrid DNA research, warned against these risks.

He proposed a moratorium, a temporary halt to research. Later, at the so-called Asilomar Conference, researcher agreed on guidelines for how experiments were to be conducted and what safety measures were necessary.

In Sweden Lennart Philipson himself has been in the midst of the debate around the genetic technique.

"We had an international discussion in 1974-75. I myself wrote popular scientific articles on the subject during this time and brought it up in the government's advisory committee on research without causing major reactions."

"The international discussion had been concluded and it had been agreed that the risks feared at the beginning did not exist, when afterwards we got a tremendously bitter debate here at home after an article by Nordal Akerman in 1977."

"It was a trying period. Not so much because we weren't allowed to do research the way we wanted to, because we could still do certain experiments abroad, in England and France. But it was the experience of having such difficulty reaching out. The journalists who visited us at this time seemed unwilling to listen to what we said; they had decided beforehand what their opinion was on the issue."

Was it wrong of Paul Berg to write this letter?

"It was probably a mistake. It was written by chemistry-oriented molecular biologists; from the beginning they should have contacted colleagues with experience in clinical microbiology. Then there would have been a more reasonable evaluation of the risks."

Has this debate contributed to the fact that you are moving to Heidelberg? Is it the result of a harsh research climate in Sweden?

"No, that's not why I am moving, absolutely not. Today the debate is played out. In the United States all special safety provisions for hybrid DNA research were removed from the beginning of this year. Sweden as well will follow the United States."

"Furthermore, I have always believed that one shouldn't be a professor for too long."

Philipson's appointment in Heidelberg is initially for 5 years.

Ten nations are financing the Heidelberg laboratory, which began to be established in the mid-1970's.

The direction of the research is governed by a body of molecular biology research scientists.

"This is quite a special situation; here you have money from every direction and then the scientists themselves have been given the responsibility for shaping the activity, that is a lot of trust."

The official name of the laboratory is European Molecular Biology Laboratory, EMBL. It has 10,000 square meters of laboratory space and an annual budget of around 85 million Swedish crowns.

EMBL has 250 employees, of whom 100 are research scientists. In addition there is a large number of visiting research scientists. Lennart Philipson says:

"It is a large international effort; it recruits a sufficiently large number of scientists to provide as tight an environment as is necessary to make lasting contributions."

You seem to reason that there is a minimum critical number of scientists needed to achieve results?

"Yes, there must be enough people, above all in such an area as this, where many kinds of approaches are necessary. You need those who look at the purely structural form of the molecules, other groups which produce recombinant DNA, purely genetic knowledge, instrument development, and so on."

According to Lennart Philipson the development of the research technique itself is something often forgotten in the national efforts.

"We need better technology--for example electron microscopes with higher resolution which utilize the latest physical findings."

"Today it takes much too long to bring out the structure of a protein with X-ray crystallography. If more energetic radiation can be utilized it goes faster."

EMBL also has an "outstation" in Hamburg which utilizes the strong X-radiation produced as a byproduct of an electron accelerator. Another "outstation" in Grenoble uses a neutron accelerator as the source of radiation for crystallography.

"This development of the research technique should be quite a vigorous program, from which all nations participating in the laboratory can profit. What is important is that this development cannot be undertaken for its own sake. It must be aimed at the solution of the most important biological problems. In order to see where increased resources are really needed, a sufficiently tight research environment is also required."

Lennart Philipson is cautious when making statements about how he wants to change EMBL's activity. He emphasizes that he is not the only one who determines the scientific program.

The laboratory is today separated into divisions for cell biology, instrument development and structural biology. A division which is not "too successful," according to Philipson.

"I took some prominent scientists there after I got this appointment and discussed what ought to be changed. Now we have come so far that we begin to glimpse certain problems on which the laboratory is to concentrate."

"Instead of being grouped into divisions, the activity is to be focused around certain approaches to biological problems. This is necessary in order to achieve a sufficiently tight environment."

As a potential example Lennart Philipson mentions the "membrane side." Thin membranes divide various parts of the cell but at the same time selectively allow certain substances to pass through. The research could study the structure of the membranes, how proteins are transported through them, and so on.

About how close does the research at EMBL lie to the applied technique?

"In the construction phase we can't include areas directly connected with the technique. On the other hand, we will use the hybrid DNA technique ourselves in order to produce the proteins interesting to basic research."

"I could also envision that a future program might take up basic research in areas interesting to industry. We could study what a vaccine should look like in order to protect against a virus and use animals as models."

Up to now, "human" insulin and growth hormone have been produced with the hybrid DNA technique. The possibilities of the technique has stirred great interest in industry. Lennart Philipson says:

"Kabi Gen has a product which in the world they alone possess: human growth hormone. Up to now it has been extracted from human pituitary glands. But enough raw material has never been available to extract hormone for more than a small portion of the dwarfs in the world."

"Now, with the new technique, it is possible to manufacture in one day as much growth hormone as previously in one year. If Kabi Gen hadn't been involved in this area, they wouldn't have been able to compete in the future."

Of course, the bacteria themselves don't have much interest in producing human growth hormone. They are also exposed to what Lennart Philipson calls "a tremendously strong selection pressure," which in a few generations would eliminate the bacteria possessing this feature, since it is of no use to the organisms.

"This is why the genes for growth hormone have been coupled with an adjacent gene for resistance to antibiotics. A weak dose of antibiotics is added to the nutrient solution. Then the resistance gene provides an advantage and is inherited and then the other one follows along."

Basic Chemicals

So far we have talked about pharmaceutical preparations, human hormones and such. Expensive substances which could require large investments for development. Could these methods be profitable even for basic chemicals?

"Actually, there are no limitations with regard to microbiological fermentation. I believe that the next step is basic chemicals. One might conceivably produce ethanol, nitrogen compounds, certain polymers. Another very neglected area is to use microorganisms to break down garbage."

"Look at ethanol. With the oil prices we have today the cost for the best microbiological fermentation is 15 percent too high. If the cost could be reduced 10 times with the hybrid DNA technique--which does not seem improbable according to our experience so far--it will become a real alternative. In this connection thermophilic bacteria, which can tolerate a temperature of 80°C, become interesting; one could then envision a continuous process, in which the alcohol is distilled out during fermentation."

"If we can make nitrogen compunds organically instead of the ammonia process used today to combine hydrogen and nitrogen, the energy required will be perhaps 100 times less."

Another area for the hybrid DNA technique is plant breeding, maybe primarily in order to obtain more plants capable of taking nitrogen from the air. "The utipian goal," according to Philipson, is to get nitrogen fixation as a direct property in cultivated plants such as corn and wheat.

"It is a tremendously difficult process which we don't know how to deal with. The intermediate step is to find bacteria which can live in symbiosis with these plants and improve their nitrogen fixation."

"Something that perhaps will come before drugs are new diagnostic tools, since they don't require clinical testing."

"One might conceive of removing a portion of the DNA sequence for a virus which is unique for this and coupling it with a carrier. If we have a slide with this substance we could add throat secretion from a patient to it and see if it binds, if there is DNA which matches it on the slide. We can see if it has combined by using radioactive markers."

"With several test slides we can receive an answer to which virus it is in about an hour, while today it takes 3 weeks with cultures and everything."

'The Mystery of Life'

Finally, I ask Lennart Philipson if, despite the extreme reductionism of molecular biology, he does not feel fear in the face of "opening the door to the mystery of life?"

"This is a question which will become a problem when we have gotten to where we can provide genetic therapy, exchange faulty genes for better ones."

"As far as improving the exchange for plants and animals, that is scarcely an ethical problem; we have been doing that for a long time in animal and plant breeding."

"For the human being I also can't see that it would be something ethically objectionable, if we were able to correct genetic diseases. So far we have no ability to do so or even to guess how it would take place. We don't know how to direct the gene to the right place. But considering how fast the development has progressed, it might be possible in 4-5 years. Then we may perhaps be able to alter one single gene and forever remove the predisposition to a hereditary disease, such as for example the metabolic diseases, in which one single defective gene is responsible for the disease."

"What has frightened people is descriptions such as in "Brave New World" or "1984," the idea that we would be able to influence a number of genes which govern intellectual ability and character in the human being. That if musical talent or possibly criminal tendencies are inherited we would try to go in and influence them."

"In that case the reductionist's view is that we don't know how they are inherited or what genes interact."

"In a fly 1,000 genes interact in order to determine the size of the wing. It must take many hundreds of time more of the interacting genes to govern the development of the human intellect. We will never have the objective or the means to make such radical changes."

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CSO: 3102/163

CODIS AWAITS FIRST DOCUMENTS FROM CHEMICAL INDUSTRY

Paris CHIMIE ACTUALITES in French 29 Jan 82 p 24

[Unsigned article]

[Text] The decision that the Ministry of Industry took last December to entrust Codis (Interministerial Committee for the Development of Strategic Industries) with two new sectors, fine chemistry and engineering, is beginning to be implemented.

However, at this time, the directors of industrial strategies (Mr Boisson) and of chemical industries (Mr Langlois-Meurinne) had not yet designated the coordinator who will arrange the workshops of the fine chemistry group (whose chairman is to be Langlois-Meurinne). As part of the Codis procedures, this coordinator has to prepare the projects and establish relations with the heads of enterprises involved in them.

Through the Union of the Chemical Industry, these enterprises had for a long time asked for the inclusion of fine chemistry into Codis. The first documents were to be received soon after the imminent constitution of the workshop and the designation of its coordinator.

The fine chemistry sector includes about 200 enterprises, many of which are PME (small and medium-size enterprises), for a business volume of more than 20 billion francs, but with a losing total foreign trade (about 700 million francs); it will therefore be able to receive privileged aid, notably in the form of discounted loans and participating loans.

Pointing out that its objective is to increase the growth rate of fine chemistry, the Ministry of Industry feels that the actions that must be taken to achieve it concern research (the additional effort is assessed at about 200 million francs per year), the public as well as the private sector, investments (the additional effort is estimated to be 2 billion francs in five years), and industrial structures. If public capital companies are to play a practical role in this sector, the ministy concludes, the effort made to support them must be accompanied by assistance to the PME sector.

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CSO: 3102/179

CHEMICALS

FORMER PUK EXECUTIVE ON RESTRUCTURING CHEMICAL INDUSTRY

Paris LE MONDE in French 16 Feb 82 pp 21, 23

[Article by Amaury Halna du Fretay, former director of the chemical branch of Pechiney-Ugine-Kuhlman]

[Text] The expansion of the public sector and the formulation of the new majority's industrial policy bring the problems of French chemistry into the limelight, a limelight intensified by the serious degradation of the sector's financial results, which are thus becoming highly vulnerable to the world economic crisis. The stakes are high, since chemistry is one of the major French industrial sectors. To find valid solutions for the current serious difficulties, it is essential to take into account the specific characteristics of the chemical industry, and to learn from past experiences both in France and abroad.

The author of the article that follows, former director of the chemistry branch of Pechiney-Ugine-Kuhlmann, argues in favor of a restructuring which would lead to the creation of a large French chemical group.

Chemistry is one of the industrial sectors--and they are not very numerous--in which Europe is a leader in production volume, exporting position, quality of technologies, as well as solidity of enterprises. Four European enterprises are among the five largest chemical manufacturers in the world: Hoechst, Bayer, and BASF in FRG, and ICI in Great Britain. In addition, the large European chemical companies have developed their industrial strength remarkably well throughout the world, and notably on the North American continent.

Except for some domains such as synthetic fibers, where technologies have been disseminated and where domestic markets have collapsed, Europe is not faced in chemical matters with the threat of savage competition, or even of decline, as in the case of other industrial sectors.

As a whole, European chemistry has resisted remarkably well the crises that we have encountered since 1973 (consistently healthy balances, perennially substantial investment programs, and so on).

French chemistry reflects some of the strong points of European chemistry: production volume (France is the world's fifth largest producer), exportation position (France is the world's fourth largest exporter), and quality of technologies. Unfortunately, we differ from the other European countries by our very low profitability. Before 1973, the results obtained by French chemists were generally positive but significantly poorer than the European average, and especially lower than those of the large enterprises mentioned above. Since 1973, we have often operated at a loss, particularly after the third circumstantial shock of 1980 and 1981.

In a country in which it is in any case difficult to secure sufficient private funds, these results have naturally led to a serious balance sheet deterioration (excessive debts), with a consequent unbearable burden of financial charges.

This balance sheet situation has not made it possible to invest sufficiently, if not within the country, which was given priority, at least abroad, where despite brilliant achievements (Rhone-Poulenc in Brazil is one example among many), the industrial implantation of French chemistry is far below that of its European competitors, notably on the North American continent.

The reason for the abnormally low profitability of French chemistry is simple: we have too many enterprises of an inadequately small size. But chemistry is one of the industries in which it is not possible to hope for success without being equal, if not larger in size than one's major world competitors, since the size factor is absolutely essential for obtaining the best cost prices.

For all that, our European competitors did not assume gigantic proportions as a result: with turnovers of 14-15 billion dollars in 1980, the German or British enterprises mentioned earlier are of the order of magnitude of Regie Renault, which no one in France considers as a dinosaur or colossus with feet of clay.

In France, on the other hand, this concentration phenomenon has not been evident. While of course there have been some mergers, there have also been splits and new enterprises have been developed. All in all, there are today almost as many large chemical enterprises with French capital as there were at the end of the last war (about one-half dozen), and their size is much smaller than that of the world's large chemical companies. The turnover of Rhone-Poulenc, France's largest chemical company, is less than one-half that of Hoechst's, which is at best in fifteenth place in the world. As to the other French enterprises, Ato-Chloe, CDF Chimie (PUK's chemical branch), and EMC, with turnovers five to six times lower than those of Hoechst, they can be found below the fiftieth rank.

During the last two decades, French chemical companies have of course made great progress in competitiveness, to the extent to which they specialized through operations known as rectification of boundary areas.

But this is not enough. When you are at a level of industrial competitiveness where everything counts, not only plant transformation costs, but the purchase price of raw materials, the cost of sales networks, administrative services, research, and the optimimum exploitation of sub-products (and they are very numerous in the chemical industry), you find that large enterprises such as the German or British ones, who because of their size can become interested in practically all the domains of chemistry, have a considerable advantage over smaller companies.

By the same token, these enterprises need a much more cumbersome, and therefore more expensive organization than that of smaller companies, such as those of one thousand employees. But this requirement for complex organization already exists for groups of the size of French chemical companies, who are thus subject to the inconvenience of the management loads of very large enterprises, without the advantages of scale and synergy.

It should also be pointed out that the need for large size in the chemical industry has never been greater than now. There are two reasons for this: first, the synergy of raw materials, which becomes increasingly important as their prices increase; and secondly, the technologic synergy in the development of biotechnology, which will strengthen the relationship between pharmaceuticals and the rest of chemistry, for instance. In fact, one of the directors of Dow Chemical declared several months ago, that by the year 2000 there would remain no more than about twenty large chemical organizations in the world. And we can add without fear of being wrong, that these twenty large enterprises will be the ones who will best succeed in fine chemistry and biotechnologies.

Of course, there are several fields which are sufficiently independent of the rest of chemistry to be able to undergo a profitable industrial development while remaining autonomous: compressed gases, for one. But such cases, in which the French industry has often succeeded brilliantly, are often not generally applicable.

It would seem that our country resigned itself to having large enterprises when the justification was obvious, notably for single-product industries. That is why the size of EDF or SNCF is acceptable, and why no one thinks of splitting Renault or Peugeot into several organizations.

With its multiple products, the chemical industry lends itself on paper--and even in practice, as long as it limits itself solely to optimizing the costs of plant transformation--to division into a number of fields, a division generally carried out according to the logic of chemical affinities studied in school or at the university, whence the name of "affiliations" that they are currently being given. But this also overlooks the essential fact that among these affiliations, there exist common interests of raw materials, technologies, and markets, as well as complementary sub-product interests, in other words very important synergies which the affiliate subdivision method prevents from being exploited to best advantage.

Reasons for Delay

In reality, this reluctance with respect to size conceals a rejection of mergers, however indispensible they are to the concentration process, this rejection originating not only from management, but also from the personnel as a whole.

Indeed, the personnel blames mergers for job eliminations, whereas the latter are really due to lack of competitiveness in some products, or to the burdensomeness of some administrative, sales, or research services. This is tantamount to blaming the medicine for the illness, and refusing to see that only preventive measures, however drastic, can avoid a fatal outcome.

Doubtless, mergers should normally go hand in hand with renewed management dynamism, leading to a more energetic tackling of cleansing operations in certain sectors, or to the realignment of overburdened organization charts. But the personnel must realize that this is the only way to safeguard its future.

For its part, management, and especially higher management, fears that these mergers will be the occasion for a dwindling of its scope of responsibilities. But all in all it is preferrable to be number two in an important and efficient department within a powerful and prosperous enterprise, than number one in a smaller department within an enterprise that faces a difficult financial situation and an uncertain future due to its inadequate size.

Naturally, this assumes that as mergers take place, the leaders will select their staffs with particular objectivity, and total impartiality with respect to their original companies. Competence criteria must be the only ones considered. If the appointments give the impression that one staff is being colonized by another, we can rest assured that the merger will be an industrial and human failure.

Those responsible for French chemistry will find themselves faced with a strategic choice which is laden with consequences.

First possibility: to form a unified and powerful entity, of a size close to that of Hoechst, Bayer, BASF, and ICI, that is, falling within the ranks of the largest chemical enterprises in the world. This is possible only if all the principal French companies are regrouped into a single enterprise.

To be sure, size alone will not suffice to make such an entity profitable and reliable. It will also have to demonstrate great management discipline, and intensify its efforts in all areas, notably in trade and in industrial implantation abroad. The fact is that the major foreign chemical enterprises which represent the competition to be faced, are remarkable not only because of size, but also because of management discipline and dynamism, especially in sales (the only sure means of opening the way for development investment, which in turn creates jobs).

In return for the changes initially imposed by such a concentration, the personnel of French chemical companies will acquire that which in fact it most wants today, namely, the kind of job security which can only come from belonging to a competitive entity, on one hand, and on the other hand, an end to this constant restructuring process, which is the fate of enterprises that have not found their proper equilibrium.

Second possibility: achieve the restructuring of French chemistry along two, three, or four axes, namely, to have several enterprises whose size is smaller than one-half that of the major world chemical companies, and whose world rank is at best between the fifteenth and the twentieth, for a short time at that, since the concentration phenomenon is going to continue in world chemistry. It will probably not take many years to realize through actual experience, that these enterprises are too small to be viable, and that they will have to merge; but in the meantime, new handicaps and delays will have accumulated, and it is not certain that such a concentration will not occur too late by then.

It is therefore to be wished that French chemistry, after in-depth analysis of the international picture, will finally orient itself toward the formation of a single entity. There is indeed no more time to be lost if we still want a French group to figure among the twenty major world chemical enterprises by the year 2000.

11,023
CSO: 3102/179

EXTRA FUNDS FOR R&D IN DATA PROCESSING FIELDS

Stockholm DAGENS NYHETER in Swedish 11 Mar 82 p 11

[Article by Eric Dyring]

[Text] The government wants to invest just over 31 million kronor in data processing during the 1982/1983 fiscal year. This was indicated by the data processing proposal presented to parliament on Wednesday.

The funds will be used to produce better data technology, primarily as an aid to the industry, but also to increase the involvement and broaden the debate on computer issues in society.

The data processing proposal was developed in an extremely short time. There was a lively debate within the government over how much the proposal should cost. Only last week Budget Minister Rolf Wirten announced the additional 31.5 million for 1982/1983. At the beginning of this week the printing presses were rolling so that several copies could be ready by Wednesday.

"We finished at the last possible minute," cabinet minister Olof Johansson, who was responsible for the proposal, told DAGENS NYHETER.

The process began over 2 years ago. At that time the government appointed the data processing commission with Olof Johansson as chairman.

Across the Border

In December last year the commission produced the report Coordinated Data Processing Policy. Critics considered it wordy and of little substance. It consisted primarily of 50 recommendations.

What was the result?

The proposal states that some of the recommendations must be studied between 1983 and 1985. This includes, for example, the flow of data across the border and how those who use computers should have a greater influence over the large data processing systems.

Other recommendations will be postponed, while a third group already has been dealt with by various agencies.

The most important goal of the proposal, however, is to create a comprehensive Swedish data processing policy, according to Olof Johansson.

Data processing questions are ubiquitous. They are found in every sector of society. There are many demands and ideas on how they should be treated.

The data processing commission was originated because of the demand for coordination in this area. It is unique in Swedish politics. It is a multi-party organ with a cabinet minister as chairman.

Comprehensive

"This is a first step toward a workable Swedish data processing policy," Olof Johansson said.

The proposal is similar in many ways to the research policy proposal presented by the government last week. It also seeks to create a coordinated and comprehensive policy. Research, like data technology, is an important and dynamic aspect of the social apparatus. The research policy proposal is also a first step. Both proposals are to be followed by new ones each electoral period.

The proposal would provide 10 million kronor for education and to stimulate the debate. The data processing commission will manage these funds and the primary instruments to be used in this work are the Council for Cultural Affairs, the Coordinating Board of Research Councils, the Educational Radio Corporation, educational associations, and popular movements.

In addition, the National Board of Education and the Office of Higher Education will study suitable educational programs.

EXTRA FUNDS IN DATA PROCESSING PROPOSAL FOR 1982/1983

Education and debate	10 million kronor
Purchase of technology (70 million kronor over 5 years)	10 million kronor (5 million from other sources)
Systems development, centers for computer-aided design and production technology, etc.	16.5 million kronor

9336
CSO: 3102/189

PLAN FOR EXTENSIVE ENERGY PROJECT WITH FORTY WINDMILLS

Rotterdam NRC HANDELSBLAD in Dutch 1 Mar 82 p 3

> [Text] Arnheim, 1 March--Dutch electricity production companies have highly advanced plans for an extensive wind energy project. They call for a "park" of thirty to forty middle-sized windmills, which would have to produce a total of 10,000 kilowatts of electricity. According to G. Van Wijk of KEMA [Office for the Inspection of Electrotechnical Material] in Arnheim, a windmill park of such an extent is unique in the world.

The wind energy powerplant is a plan of the directorate of the Cooperative Electricity Production Companies (SEP) in Arnheim. Costs are estimated at several million guilders. According to Van Wijk, implementing the construction of the wind powerplant, if possible some time this year, depends partly on the financial support the government makes available. The plans call for experimenting in several areas, for example, particularly the problem of rapidly changing wind speeds.

It is not yet known where the powerplant will be built. According to Van Wijk, though, it is very probable that it will be in the western part of the country or in one of the Flevoland reclaimed areas, because those areas of the country enjoy the most wind.

The windmills are to be produced in Dutch factories. According to Van Wijk, that is very important to employment. "The assembly of the windmills, but also the manufacture of the various components and the building and maintenance of the powerplant will certainly create a lot of jobs."

Cost

The cost of one kilowatt hour generated by electricity will be about 36 [Dutch] cents as compared with 22 cents per kilowatt hour of electricity generated by oil or gas, but according to Van Wijk: "Wind energy seems at first to come out a bit more expensive, but production is much more benign environmentally. That is worth quite a bit, too, so it does not hurt if it costs a bit more."

According to him, wind energy has a secure future. The SEP directorate expects that by the beginning of the next century, wind can generate about 7 percent of the electricity needs. For that, though, it is necessary that the energy generated by the wind will be able to be "stored." Direct transmission of the wind energy to the national power network is risky because the powerplants are dependent on the changes in wind speed (no power is gnerated because of too little or too much wind, because the windmills have to be turned off for safety reasons).

According to the SEP, it may be assumed that wind will be able to make a contribution to future electricity supply, but it is also necessary that as soon as possible a number of existing oil- and gas-fired powerplants be rebuilt to run on coal. Furthermore, depending on the growth of electricity consumption over the next 30 to 40 years, the SEP considers it necessary to build another five to seven big coal-fired powerplants and three to seven big nuclear powerplants.

6940
CSO: 3102/170

DANISH-SWEDISH WINDPOWER COMPANY FOUNDED IN DENMARK

Stockholm NY TEKNIK in Swedish 4 Feb 82 p 3

[Article by Mikael Holmstrom: "Now Industry is Taking Windpower Seriously: ASEA Wind in Denmark"]

> [Text] ASEA [The Swedish General Electric Co.] has founded a windpower company in cooperation with the Danish state and a Danish company. They expect to build 250 windpower plants through 1984. If a Swedish market opens a similar partner company can be formed in Sweden.

In 1907 ASEA sold windpower plants in Sweden, and now it is happening again. Stal Laval, which is a subsidiary of ASEA, already sells gears for large windpower plants.

But now ASEA itself is going into the windpower business. The beginning will be in Denmark via the subsidiary company.

ASEA owns one-third of the new Danish company, Danish Wind Technology. The other two-thirds are owned by the Danish Ministry of Energy and the Volund Company. Volund is already active in windpower, and is the base of the new company. It has given the enterprise a flying start, having 64 employees.

The most interesting product of the new company is a power plant with a three-bladed turbine. The turbine diameter is 28 meters and the power is 265 kilowatts. The turbine blades are fiberglass, and the 25-meter high tower is steel.

This power plant exists in prototype, and as soon as the hard winter is past it will be placed in operation by a power company in South Jutland.

This power plant has already been launched in the United States, and Danish Wind Technology informs NY TEKNIK that they have had a large number of inquiries about it.

250 Windpower Plants

This year they plan to build about 10 power plants, next year 40-50 and in 1984 they will have built a total of 250. The entire production, however, will not take place in Viborg, but probably in licensed facilities elsewhere.

The Danish Electric Company's two experimental power plants at Nibe have blades of which the fiberglass components came from Volund (just now they are searching for cracks in those blades). On the whole it is considered that the two experimental power plants functioned well.

Even though nobody will officially confirm it yet, the industry expects that more large power plants, in the 1 megawatt range, will be ordered in Denmark in the next few years.

The new Danish firm has plans for such power plants. They will be the same size as those in which Sweden is now interested.

Largest in Windpower

The new Danish company today employs about 25 engineers. In one year that number will be doubled. That will make the new company the largest windpower business in the Nordic countries, and probably a competitor of the Swedish firm Windenergy (which is owned by Svenska Varv) and Kamewa, which is building two 2-kilowatt Swedish prototypes.

While the market in Sweden is still considered small, it is estimated that 600-1000 windpower plants have been installed in Denmark in recent years. Denmark and the United States together comprise the greatest market for small windpower plants today.

With this new company ASEA is stepping up from being a large subcontractor to being directly engaged in the windpower business.

According to what NY TEKNIK has learned, ASEA is ready to start a Swedish windpower business when the market is ripe.

Generators

But as in Denmark, it will not be wholly owned. ASEA's interest lies in generators and equipment for connecting and monitoring systems. Mechanical items and blade fabrication will probably be turned over to others--like the new Danish company.

9287
CSO: 3102/191

BELGIUM, FRG UNDERGROUND COAL GASIFICATION PROJECT

Brussels KNACK in Dutch 24 Feb 82 pp 58-59

[Article by Lode Willems: "Another 20 Years and We Will Be Rich Again: Test of Coal Gasification in Thulin"]

[Text] In Thulin in Wallonia an optimistic experiment is getting under way after 2 years' preparation. It involves a Belgian-German [FRG] project for underground coal gasification. What does coal gasification mean? Strictly speaking, you are gasifying coal whenever you burn coal in a stove. For that, the coal first has to be dug out of a mine, sorted out, and then carried to the user, in short, the classical method, which brought considerable riches to our country in times past. But in the meantime, our coal mines have played out to a considerable degree, and moreso in Wallonia than in the Kempen--played out, because in these developments we have penetrated to the maximum as far as profitability and safety are concerned.

At great depth, however, there is still a colossal coal deposit. Recent checks have shown that this deposit lies in an arch running continuously from northern France through southern and eastern Belgium, below the North Sea and into part of Great Britain. These five EC countries are sitting on top of a black goldmine. With classical methods, we cannot get to it. With a more modern and technically somewhat more complicated but practically more direct method, that of underground coal gasification, we can assure our future for more than a century. That sounds nice, and it is, too, but first there will have to be investments and experiments made. And after 20 years' patience, it can be accomplished.

As far as Belgium is concerned, the matter is in the hands of the INIEX (National Institute of Mining Industries), administratively located in the Rue du Chera in Liege. "It is a question of long-term research," says Director P. Ledent. "A long time will be required to put the technology of underground coal gasification on its feet."

It really is difficult, in a time of full crisis and unemployment, to get the public interested in a project which contains promises for 20 years from now. We are not used to thinking on a time scale like that.

Director P. Ledent: "Even so, it has always been like that for energy. The large-scale exploitation of petroleum began in the 1940's and it took 20 years

before 1 percent of the present consumption was reached. It went just the same way with natural gas, and with nuclear power, too. The technique was already known in 1950. Not until 20 years later, 1970, was 1 percent of our current production attained. It is true that some countries made quicker progress, and that was so because in that specific area they made an extraordinary effort. Investments are always an important factor. And it takes years before the thing becomes operational. Even for classical mining this is true. Take our coal mines for instance: between the decision to develop coal mines and the production of coal, there is a 10-year delay. It all depends on the size of the operation."

Underground coal gasification is vitally important to Europe. Just look at the EC countries' distribution of energy sources: 70 percent of our energy consumption is dependent on fluid energy sources (52 percent on petroleum and 18.3 percent on natural gas). Coal and allied sources still provide 23 percent of our energy production; we produce 4.6 percent with nuclear power, and for 1.6 percent we have water power.

The big block of 70 percent has to be imported for the most part. We do have some petroleum in the North Sea and some natural gas in Europe, but the oil tankers have to import megatons from the Arab world, and even for our natural gas we have to depend in part on Algeria and shortly on the Soviet Union. If we can now gasify the coal which exists underground below us in mountains of cubic kilometers at depths between 1,000 and 2,000 meters, then we can multiply our own European energy sources by 10. And there is even more.

Director Ledent: "We possess fantastic reserves. What we have beneath us at depths of from 1,000 to 5,000 meters is half of the world supply. But, and I emphasize this, we must not hold any illusions about the period in which we will be able to make a real start on this."

The length of that period, estimated at 20 years, depends on a number of factors, including how the research project runs and how long it takes after that before the matter can be addressed industrially.

Coal gasification is not new. The Soviets were already doing it in the 1930's. Their technique was intended for direct generation of electricity, and they never went deeper than 300 meters. Europe has little to learn from their experience, because we can do no more at a depth of 300 meters. All supplies at that depth have been exhausted. For Europe, underground gasification has two essential aspects: first, we possess enormous supplies at great depths, and second, we must also aim for all kinds of industrial applications, such as petroleum derivatives, methane, methanol, synthetic gasoline, plastics and artificial fertilizer.

If we succeed in tapping these rich energy sources, Europe can become completely independent of the outside world. We understand all too well what that means in this crisis period, when oil prices are growing by leaps and bounds, when we depend for the most part on the Arab world for our petroleum, and for the rest [natural gas] also on the Arab world and shortly also on the Soviet Union.

The approach to the experiments now under way in Thulin began in 1974, when Belgium decided to do research in this area. On 1 October 1976, we signed an accord

with the German Federal Republic for collaboration. On 1 April 1979 the preparatory work began in Thulin to repeat experiments at greater depths which had already been carried out successfully at lesser depths.

The financial distribution was initially 49 percent for the FRG and 51 percent for Belgium. In the meantime, the EC has stepped in with 40 percent, and the remaining 60 percent of investments are evenly divided between Belgium and the FRG.

In 1979, 600 million francs were allocated for preparatory experiments over the period 1979, 1980 and 1981. It is expected that if things go well, a second series of works will be financed from 1983-85.

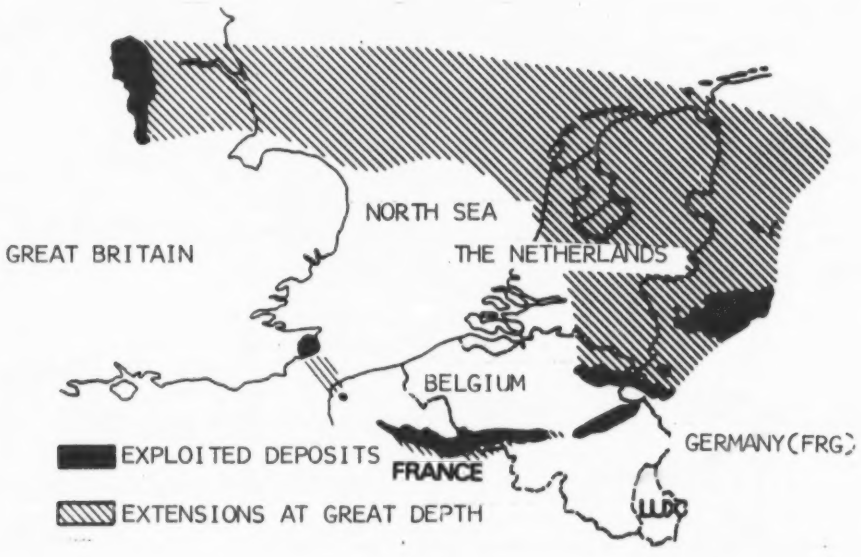
P. Ledent: "If the experiments in Thulin turn out well, we will already have thermal power available of the order of magnitude of 10 megawatts, but let us be clear on that, that is thermal megawatts. It should be possible to realize that during the first stage of 1983-85. We should be able to reach a maximum of 15 to 20 MW. In order to go further, it will be necessary to go on to a second experimental phase. Later we will be able to reach 200 and 250 MW. The experiments in Thulin will run to 1985-86. After that, preparations will be made for tests on a larger scale in the Federal Republic. It should be possible for them to begin in 1986. In the meantime, the Netherlands, too, has expressed an interest in participating in these investments. Around 1990, we should have built up enough technical knowledge to begin industrial works on a larger scale."

The only large-scale installation of the kind that is now being worked on in Thulin exists in Johannesburg in South Africa. This country began even earlier with coal gasification because it wanted to make an effort to become independent of Arab imports. Director Ledent expects that eventually underground coal gasification will produce a yield of 65 to 70 percent more than classical coal mining. "If we succeed," he says, "we will be able to reach a production which is comparable with what we now have to import, and probably more. Just think what that means for our independence and our economy: Instead of having the money pour into the Arab banks, it would produce work for Europeans, on the basis of European products. We should become autonomous in the area of energy and the money would create employment for Europeans. At this time, France has also begun studies in this direction, but they are getting a much later start than we did. We are the first to try industrial exploitation."

The total cost of the experiment is estimated at 1.35 billion [Belgian] francs. The experiment will run in three stages, the first of which is now complete. The goal of the first stage was to gasify coal at a depth of 860 meters, with a mixture of air and steam at high pressure (to 45 bar).

The second stage, which has now begun and will last 1.5 years, or until the end of 1983, has to do with other retrocombustion experiments in the same area around Thulin, but this time with a mixture of pure oxygen and steam at high pressure. The third stage is planned to take 2 years, from 1984 to 1985, and during this stage the experimenters want to try working at greater depths. They want to go 100 meters deeper, to 950 meters. The gasification in that stage will be carried out according to a method indicated by the results of the two earlier stages.

Thulin lies southwest of the city of Mons, near the French border. In the immediate area of the vein in Thulin, no coal has been mined thus far, so that this is an entirely new development. To be sure, it is not an immediate solution for the crisis we have to fight now, but we will still have to live in 20 years. And better then than now. "We are working for the end of this century and the beginning of the 21st century," says Ledent.



There is a gigantic coal deposit under our feet, enough for a century of European energy independence, and perhaps even more. It is at great depth, from 1 to 5 kilometers down, where the coal miner cannot go, but where thanks to new technologies another kind of coal mining is becoming possible.

The black areas are the areas where coal mines are currently being exploited, the striped areas comprise the deposits at great depth.

6940
CSO: 3102/174

FRANCE TO TRY FUEL OIL-COAL MIXTURE AS SUBSTITUTE FUEL

Paris LE NOUVEL ECONOMISTE in French 15 Feb 82 p 55

[Article by S. S.]

[Text] Just like wine, oil can also be "cut." With coal! An equal part mixture of liquid fuel oil and coal particles in suspension (40 to 50 microns in diameter) remains highly energetic: its heat capacity, equal to 4 megawatts per ton, is midway between coal (3 MW) and fuel oil (4.8 MW). The advantage is a savings of the expensive commodity that oil will continue to be.

Japan has just launched the first project in the world for the industrial use of this mixture. A generating plant fired with this new fuel will be operational in 1984. And as early as this year, Tokyo Electric Power--one of the nine largest private electric power companies in Japan--will begin the construction of a plant, which within five years will be able to supply nearly 5 million tons of fuel oil-coal mixture.

France is also very interested in the fuel oil-coal mixture. A program to study this process, financed partly by DGRST (General Delegation for Scientific and Technologic Research), has for the last one and one-half years joined Compagnie Francaise de Raffinage, Elf-Aquitaine, Charbonnages de France, Creusot-Loire, and the French Petroleum Institute. Given the decidedly nuclear options adopted in France by the government and Electricite de France, the final objective cannot be the same as Japan's. A generating plant fed with a fuel oil-coal mixture is out of the question. More modestly, France would like to use this alternative to encourage the consumption of coal by small and medium-size enterprises, without at the same time forcing them into expensive transformations of equipment, which is currently fired with fuel oil alone. In technical terms therefore, the problem is to perfect a stable mixture whose flow and combustion properties are as similar as possible to those of fuel oil. Consequently, only the filtration and pumping systems on existing equipment will have to be adapted, and the volume of boilers slightly increased. To verify the results of the fundamental research conducted in the study program, a pilot industrial test will be started in a few weeks at Montceau-les-Mines, in the Houilleres du Bassin du Centre et du Midi.

Once installed and supplied by a pilot unit which will manufacture 8 tons of mixture per hour, the boiler will be capable of producing an average of 50 tons of steam per hour.

No one yet knows how much this type of equipment will cost. But one thing is certain: compared to the 7 centimes per coal-therm, and the 11 centimes per fuel oil-therm, a fuel oil-coal therm will cost 9 centimes. Which will be that much saved on oil bills!

11,023
CSO: 3102/172

DISTRICT HEATING PLAN ADOPTED, FUNDS TO BE MOBILIZED

Duesseldorf VDI NACHRICHTEN in German 1 Jan 82 p 1

[Article: "Expansion Program for Distributed Heat Is Set in Motion"]

[Text] The program for expansion of coal-fired heating plants and heat distribution systems has recently been undertaken by the federal and state governments. In the wake of the expiring program for support of future investments, this new subsidy catalogue jointly structured and financed by the federal and state governments will support the expansion of distributed heat for 5 years with a total of DM 1.2 billion. According to the Federal Government, total investments of more than DM 5 billion will be mobilized through this program. In addition, a future increase of 7.5 percent can be claimed in accordance with an investment escalation provision.

The new investments for the generation and distribution of heat have become more attractive, and will likely remain so in the future, because of the large increase in recent years of the competing energies oil and gas. Until now, distributed heat has supplied about 8 percent of the energy required for space heating and warm water preparation. Further timely expansion of distributed heat desired by the Federal Government has run into several economic and location related difficulties arising primarily from the high network costs. This gives rise to the requirement for additional subsidies for distributed heat.

The construction of facilities near the point of use is foremost among the subsidized projects. In this connection, the Federal Government deems it very important that the states and municipalities reserve an adequate number of suitable locations. An additional stimulus for construction of decentralized coal-fired heat plants is to be expected from the introduction of fluidized-bed technology. With this technology, the emission of sulphur dioxide and nitrogen oxides from burning coal can be significantly reduced even in small heat plants. Support funds amounting to DM 250 million have been expended on the research, development and pilot facilities required to bring this process to market maturity.

In the view of the Federal Government, large power plants should not only provide electricity but should also increase their output of distributed heat. The German electric power industry has expressed its basic willingness to comply.

9160
CSO: 3102/173

COAL-METHANOL PIPELINE SYSTEM STUDIED

Dusseldorf BWK: BRENNSTOFF-WAERME-KRAFT in German Jan 82 p 6

[Text] A study on the topic of "Hydraulic Transportation of Coal in Pipelines Using Methanol as the Carrier Fluid" has been carried out jointly by the Mannesmann Facility Construction Company AG, Duesseldorf and Friedrich Krupp GmbH, Krupp Facility and Steel Construction Company, Duisburg. The purpose of the study, which was supported by the Federal Ministry for Research and Technology (BMFT), was to determine the state of knowledge in this field and to evaluate methanol as a carrier medium for transporting coal through pipelines. Several aspects such as rheological behavior, corrosion and chemical compatibility were examined in detail through experimental investigations.

Both the experimental and theoretical investigations showed that coal-methanol transportation through pipelines is technically realizeable. Above certain quantities and beyond certain distances, this system can compete with conventional transportation systems such as rail, ship and barge. A computer model was used to determine the costs of the various transportation systems over several distances. Specifically, transportation costs per energy unit for an energy equivalent of 4.6×10^6 t of hard coal per year over distances of 350, 600, and 1000 km were calculated for the competing systems named above. European conditions were assumed. It was shown that the specific transportation costs of the coal-methanol pipeline system for all distances amounted to about 35 percent of the costs of the most favorable competitor.

Detailed results of the study were presented in an article "Pipeline Transportation of Coal-Methanol Mixtures" in the March edition (3) of BWK. The authors are Dr Ing E. Goedde, Pipeline Engineering GmbH, Essen and Dipl Ing H.W. Kueppers, Mannesmann Facility Construction AG, Duesseldorf, who were intimately involved in the study.

9160
CSO: 3102/173

BRIEFS

COMES BUDGET UP FIFTY PERCENT--A particular effort has been successful in promoting renewable sources of energy, with an increase of 50 percent in the budget allocation of COMES (Solar Energy Commission), which goes from 200 MF in 1981, to 300 MF in 1982 (to which will be added 9.5 MF from the Ministry of Cooperation). The distribution of COMES allocations among various task forces is the result of a voluntary policy, reflected in a selective release of allocations. The resources of two task forces will increase significantly: the Dissemination Task Force, whose allocations will increase by 126 percent (70 MF compared to 31 MF) to intensify regional actions and the dissemination of solar energy utilization among major users (housing and business); the preferred targets being new private housing and existing collective housing. And the Biomass Technology Task Force, whose allocations are increased by 60 percent (from 50 MF to 80 MF), primarily for pursuing a substitute biofuels plan, and for launching a long term program for solar bioenergy. The first constructions to be involved will be units to demonstrate the production of an acetone-butyl mixture, and of methanol by gasification of wood with oxygen. They will be accompanied by research and development projects, some of which will be associated with biotechnology. On the other hand, the means of the Direct Solar Technology Task Force will be maintained at a level close to that of 1981; however, this stability will cover two contrasting changes since two priorities are listed: photovoltaic conversion (29 MF compared to 23 MF, for an increase of 26 percent), and the launching of a wind power program (10 MF). [Text] [Paris SEMAINE DE L'ENERGIE in French 2 Feb 82 p 11] 11,023

CSO: 3102/178

DASSAULT, MATRA MARKET CAD/CAM SOFTWARE IN UNITED STATES

Paris SCIENCES & AVENIR in French Jan 82 p 17

[Unsigned article: "Success for French Software"]

[Text] Dassault and Matra are scoring points in a particularly advanced sector: computer-aided design and manufacturing (CAD/CAM). IBM has bought the non-exclusive right to distribute the CATIA software developed by Dassault. Matra in turn, announced the creation of a subsidiary in the United States, to sell its EUCLID software across the Atlantic.

CAD/CAM is an extension of CAD (computer aided design). It has been 15 years since the large automobile, aircraft, or ship builders have replaced their drafting tables, slide rules, and logarithms, with the cathode-ray tubes of computer terminal screens, thus transforming the work of many design offices.

The progress achieved by both CATIA and EUCLID is to enable a three-dimensional representation of the model being designed by an engineer. Whereas until now, the work involved a two-dimensional symbolic representation such as the one on a drafting board, from now on the object itself will appear on the screen, with its depth, its volumes, and its voids. The operator can change it and move it at will, as if it were a real model; the difference is that each operation takes several seconds or fractions of second, and that the screen indicates all the new coordinates and results of requested calculations.

Another advantage of CATIA and EUCLID is that they have been liberated from computer languages. The dialog between the machine and the engineer becomes extremely interactive, easy, and natural, even for non-programmers.

For this, the Dassault and Matra researchers have made use of semiology, or the science of signs. The hand no longer types a code on a keyboard, but selects by physical contact, using an electronic pen, symbols presented on a graphic screen--just as various dishes are presented on a restaurant menu. No longer will we need long apprenticeships or mutual understanding between two engineers located thousands of kilometers from each other: the image of a straight line is the same for a Frenchman, an American, a Japanese, or a German.

Even better, during the design of a part, the various phases of its creation can be memorized, with each operation performed by the engineer being stored by the computer. Thanks to this historical record, a play-back of the design can be obtained at any time to retrace the procedure used in the creation of the part. The engineer or programmer must henceforth consider the computer as a partner whose memory remembers his thinking process.

We must not conclude however, that CATIA and EUCLID are identical. Dassault-Systemes and Matra Datavision are serious competitors. Originally designed to manufacture Mirage planes, CATIA has been particularly concerned with a rigorous mathematical description of surfaces, such as an aircraft wing. It does this by solving three dimensional problems by means of warped surfaces, which means that it uses a smoothing approach. EUCLID on the other hand, solves three dimensional problems by considering surfaces as a succession of facets; the algorithms of the two are thus entirely different. The superiority of CATIA has its drawbacks: the warped surface approach makes it a priori impossible to solve problems involving the intersection of two bodies. This presents no difficulty for EUCLID, which also recognizes perfectly well the inside and outside of an object, and works on hidden surfaces as easily as on others.

However, this fundamental difference between CATIA and EUCLID is being reduced.

Another difference does threaten to eventually become more important: CATIA was designed to operate on IBM computers, whereas EUCLID is independent of the computer type. Because Dassault used IBM equipment, it was natural that it would write its software in terms of its hardware. EUCLID on the other hand emerged from research conducted at CNRS (National Center for Scientific Research) by workers whose essential concern was to create an autonomous tool. In particular, CATIA's dependence is notable by the fact that it cannot make drawings or plans by itself; it must use CADAM, a tool designed by Lockheed, which is relatively expensive. EUCLID can draw its own plans.

EUCLID's independence is also reflected in its relative simplicity; it does not require very large computers, and in fact is especially adaptable to minicomputers, meeting the requirements of various small and medium-size industries.

The strong competition between CATIA and EUCLID must not obscure the essential fact that these two programs are without peer in the world. Neither the Americans, nor the Germans, nor the Japanese have developed a comparable technique. Actually, EUCLID would have been sold to the Russians had it not been for the veto of the French minister of defense.

11,023
CSO: 3102/166

OPTICAL FIBER MULTIPLE SENSOR FOR GRIPPING COMPLEX OBJECTS

Paris L'USINE NOUVELLE in French 11 Feb 82 pp 48-49

[Article by Michel Defaux: "Robots: The All Purpose Grabber is Here"]

[Text] Optical-fiber technology has made it possible to build an experimental grip endowed with the sense of touch. Intended primarily for industrial robots, it is indispensible wherever there exist problems of environment or safety, or objects that are fragile, or of varying shapes or dimensions.

"We now have a solution for a problems which has been of concern to many researchers: to endow a machine with the sense of touch," states Philippe Bottiau, director of the Industrial Equipment Division of Souriau, unveiling a three-fingered grip for industrial robots.

Robots are presently incapable of perceiving their environment and of adapting to it. This raises problems, particularly in maintenance, assembly, and arc welding (bead continuity).

Research and industrial applications are being carried out everywhere, primarily using television cameras to simulate vision. The engineers at Souriau have taken another approach by using their optical-fiber multiple sensor (Multifoco), perfected a year ago as part of a DGRST (General Directorate for Scientific and Technical Research) contract for complex automatic devices (assembly machines, robots).

The advantages of optical sensors are well known: miniaturization, immunity from interference, thermal resistance, and so on. But the drawbacks created by the impossibility of direct utilization of optical fibers, and by their sensitivity to shock and pollution, led Souriau to conceive an original system for an artificial sense of touch, based on optical-fiber sensors (Stafo) integrated into the structure of the grip's fingers.

Successful Grasping of Fragile or Complex Objects

As soon as one of the fingers touches the object to be grasped, the grasping motion ceases and the grip automatically recenters itself until detection of the contact disappears. Grasping then resumes until a second finger touches the object. The sequence continues for the third finger. When the three fingers are in contact with the object, the grasping motion continues until the optical-fiber dynamometer indicates that a predetermined value has been reached. The grip then moves to its upper position with the object. Grasping tests have successfully been conducted with simple and complex geometrical shapes, and on deformable and even fragile objects (eggs). "It was a feasibility study," we are told by Jean-Jacques Crosnier, engineer in charge of opto-electronic systems. "This three-finger grip model, associated with an overhead-track system of motion, cannot do everything. We designed it for a robot to assemble small parts (1 cubic decimeter and 1 kg), which are commonly used in household appliances for instance."

The builders do not conceal that they are presently in a phase of research and of contacts with manufacturers of robots and automatic devices. "We are negotiating for government help," concludes Mr Bottiau, "to fabricate and sell this type of product, as well as other optical-fiber sensors designed to maintain bead continuity or the grasping of deformable objects."

11,023
CSO: 3102/166

SWEDISH HIGH-STRENGTH POLYETHYLENE FIBERS DEVELOPED

Stockholm NY TEKNIK in Swedish 28 Jan 82 p 46

[Article: "Longer Molecule Secret to Strong Polyethylene"]

[Text] The secret to making extremely strong polyethylene is stretching out the molecular chains. Ulf Gedde, Jan-Fredrik Jansson, and several coworkers at the Institute of Polymer Technology at the Stockholm Institute of Technology can produce polyethylene fibers strong enough to compete with modern fiber composites and steel.

"We are working on cold-stretching the fibers," Ulf Gedde said. "This provides the molecular arrangement we are seeking."

"Other techniques include so-called solid phase extrusion (extrusion of solid material) and various spinning techniques."

"Today we have achieved a fiber strength that may be used commercially."

Reinforce with Fiber

The next step is to reinforce ordinary polyethylene (LD polyethylene) with the fibers. The researchers take thin films of "ordinary" polyethylene and roll the fibers into the film. For the fibers to adhere properly, the film should be melted. The melting point of the polyethylene fiber is higher than for ordinary polyethylene, so that the fiber does not melt when it is rolled into the film. Then such fiber-reinforced film of polyethylene can be baked together into larger sheets.

Ulf Gedde now has sample bars of polyethylene containing fibers of strong polyethylene. It is a type of composite in which the two components actually consist of the same material.

To Be Exploited

The project now is about to be exploited. The technique of producing fibers and baking them together with polyethylene film can be an industrial process.

There are disadvantages with polyethylene fiber, however. The material becomes weak perpendicular to the direction of the fibers. In addition, polyethylene cannot withstand high temperatures. It loses its strength above 130° C.

Polyethylene cannot withstand as much compression as, for example, steel.

But Ulf Gedde believes that the material can be useful. He stated that in many structures the stress is greatest in one direction. It is possible, however, to arrange polyethylene fibers so that the composite is strong in various directions.

The polyethylene used by Ulf Gedde and his colleagues is manufactured in Sweden. The fibers are HD polyethylene. It is relatively heavy and the molecules are relatively long.

In the film into which the fibers are baked, LD polyethylene is used. It is lighter. HD stands for "high density" and LD stands for "low density."

"Composites with polyethylene fibers will be used in communications," according to Ulf Gedde. They will be used wherever light, but at the same time rigid and strong materials are needed.

Airplanes

Here Ulf Gedde is referring primarily to automobiles and airplanes. He adds, however, that it is still uncertain in which area polyethylene fiber will be used first.

"Glass-fiber-reinforced polyester is a competitive material. Its properties are similar to those of polyethylene-fiber-reinforced plastic."

Today the aviation industry uses fiber-reinforced composites, but more expensive fibers such as Kevlar are used most often. This is because materials are needed that can withstand temperatures up to 100° C.

9336
CSO: 3102/189

SCIENCE POLICY

SUMMARY OF RESEARCH BILL OUTLINES POLICY

Paris LE MONDE in French 11 Mar 82 p 10

[Article: "Outlines of the Research Bill"]

> [Text] The technological research and development orientation and planning bill has just been submitted to the Council for Economic and Social Affairs. A report is attached to the two sections of the bill. The first one is very short; it consists of only four articles dealing with financial matters. The second, much larger, defines the orientation of the research policy, the statutes of the personnel, and the legal structure of the organizations and new institutions for the dissemination of scientific and technical culture.

Technological Research and Development Expenditures

Under the bill, the civilian budget will cover four types of activities: programs designed to stir interest, basic and cognitive research, finalized research, and technological development programs extending over several years. This budget is expected to increase until 1985 at an average annual rate of 17.8 percent by volume--with an increase in personnel of 4.5 percent per year. Individualized amounts would be earmarked in the budgets of organizations and in the intervention funds of the Ministry of Research and Technology for the programs designed to stir interest.

The report suggests that state enterprises should increase their research expenditures by 10 percent per year. Incentives would be given to achieve an overall 8 percent increase of the research financed by all of the enterprises. The finan- [one line missing] should progress by 13 percent per year.

The minister will present an annual report to the Parliament on the conditions of implementation of this national research effort.

Regional Research Policies

The regions will be associated to the development of the national policy. They will define programs of regional interest, extending over several years, and which might lead to agreements with state or private organizations. Each region will appoint a regional consultative committee to which these programs will be submitted.

Research personnel

1. Training. Individual grants (remunerations which would qualify the recipients for social security benefits) would be granted to the personnel in training at universities, at high-level professional training colleges, but also in the labs of companies or state organizations. The author of the report anticipates a doubling of the number of these grants between now and 1985.

2. Mission. The development of knowledge, its transfer and application in enterprises, the dissemination of scientific information and culture, participation in professional training, and research management are the tasks assigned to those employed in research.

3. Statutes. They will guarantee the right of research personnel to continued education, their autonomy in the choice of an approach to specific problems, and their participation in research evaluation. They must further the circulation of personnel between all research locations, including companies. The bill provides that positions of responsibility would be assigned only on a temporary basis.

The statutes of state institutions having a scientific or technological character created by the bill would differ from the general statute of public service in several respects: hiring would not necessarily be the result of a competitive examination and would be open to non-citizens; the rules concerning transfer and the cumulation of public and private jobs would be relaxed. In the other institutions and in companies, the qualifications acquired through research would have to be recognized in collective bargaining agreements.

State Research Institutions

Those institutions which are not of an industrial or commercial nature would be classified in a new category: state institutions of a scientific or technological nature; they would have a board of directors, a scientific council and a board of evaluation including elected representatives of the personnel. These institutions could take participations and create subsidiaries. Decrees will determine their status in greater detail, especially with respect to financial control. With regard to financial control, the report mentions that preliminary authorization would continue to be requested only in few cases.

The research institutions could--for predetermined periods--become members of public interest groups constituted as corporate bodies and enjoying financial autonomy. Private enterprises could take minority participations in such groups designed to facilitate the transfer of knowledge and the valorization of research, although they could exert any other activities consistent with the missions of their members. The creation of these groups would result from an agreement between their members, which would have to be approved by the administration.

Dissemination of scientific and technical culture

A "center for sciences and techniques" will be created at La Villette [Paris] as a state institution enjoying financial autonomy; the scientific and technical culture centers which the regions might create will receive state support.

Planning?

The minister of Finances does not like much planning extending over several years. While the "orientation" section of the research orientation and planning law is well developed and places well-defined constraints on the decrees which will determine its application, the "planning" section is almost non-existent. The proposed progression rates--17.8 percent for the financing and 4.5 percent for the personnel--are guaranteed only as to their average value over three years; they could be revised once a year at the same time as the conditions of implementation of the national research effort.

As a comparison, the 1976 military planning law determined, for each of the three sections of the army, the annual breakdown of expenditures, and provided figures concerning the personnel and the equipment programs. The report attached to the research bill contains hardly any figures. It contains only the themes of the programs designed to stir interest (diversification of the energy sources, biotechnologies, development of the electronic production, scientific research to help the Third World, employment and improvement of working conditions, promotion of the French language and of scientific and technical culture, technological development of the industrial fabric) and those of technological development programs (nuclear production of electricity, space, civilian aeronautics, oceans).

9294
CSO:3102/187

NATIONAL CONFERENCE ON RESEARCH, TECHNOLOGY CONCLUDES

Paris CHIMIE ACTUALITES in French 29 Jan 82 p 11

[Unsigned article: "Priority of Biotechnologies Reaffirmed"]

[Text] On three occasions, in his opening speech for the national observance of 13-16 January, which concluded the National Conference on Research and Technology, the President reasserted the priority that the government intends to assign to biotechnologic research, among such other major fields as electronics and data processing.

Pointing out that the government's objective is to raise the share of the gross domestic production (PIB) devoted to scientific and technologic research, from the present 1.8 percent to 2.5 percent in 1985, the Prime Minister, Mr Mauroy, and the Minister of Research, Mr Chevenement, estimated that the priority objectives for research, which among others are "to shatter the isolation of research, establish a new balance between fundamental and applied research, formulate mobilizing programs and include them in a programming law, and cleanse and rationalize the relations between research and industry," had been conceived during regional meetings and national days, which were unquestionably successful with researchers.

The report on the work of the Research, Technology, and Industry Commission, written by Dr Jacques Robin, former director general of Clin-Midy Industries and scientific adviser of Sanofi, is symptomatic in this respect. He pleads "for industrial efficiency on the part of research" (for instance through the creation of implementation task forces in government centers, the development of all technology transfer structures, and the establishment of a "technologic 1 percent" to replace current parafiscal taxes in order to finance work in research centers, work for which the government would "double the bet" of enterprises).

He also insists on "a necessary coherence between industrial research and industrial policy, and on the need for pluralism in technologic options" (while at the same time making use of the existence of a Public Office for Evaluation of Technologic Options to clarify these options through independent studies). Dr Robin also asks for a coherent whole in services (training, information) and financing formulas (remolding of the professional tax to encourage innovative enterprises, automatic assistance for enterprises rather than subsidies which "develop a welfare mentality," and which on the other hand could take the form of help in hiring researchers).

Dr Robin concludes that "enterprises must be able to be free from any doubt that the law for orientation and programmation will strongly and encouragingly renew research in industry; in turn, the government is entitled to expect an exceptional effort from the enterprises."

11023
CSO: 3102/178

MAINTENANCE SHOP ABLE TO RESHAPE TGV WHEELS IN EIGHT HOURS

Paris L'USINE NOUVELLE in French 11 Feb 82 pp 74-75

[Article by Edmond Degrange]

> [Text] The pit lathe designed by Sculfort for the SNCF [French National Railroads] maintenance shop not only machines the 52 wheels of the TGV [Very High Speed] train in one-half less time with a carbide tool, but it also first measures the wear on all the wheels and computes the minimum machining cut to make.

"For the TGV, reshaping of the wheels is not appreciably different from the reshaping of other kinds of equipment, which has been performed on 'pit lathes' since 1955. One difficulty comes, however, from the extremely tight service of the TGV, making a very severe reduction in the layup time of the trains necessary," Robert Baldocchi, enginner, assistant to the head of the Paris-Southeast equipment shop of the SNCF. And the job is sizable for the reshaping machine, because one TGV car has 13 trucks, that is to say 26 axles and, therefore, 52 wheels!

Except in case of serious deterioration, the trains are never uncoupled, at any rate for routine maintenance work. When the dimensional surveys made in the shop show that the tolerances have been reached, the complete train is sent for reshaping.

Usual defects involve wear on the diameter (uneven depending on the point considered with relation to the reference plane), out of true, wear on the flange, as well as appearance of flat parts or chipping due to braking. At present, the wheels wear rather rapidly, in view of the lack of adaptation of the tracks. The 2 months of commercial service experience lead to reshaping after 120,000 kilometers, but it is anticipated that this distance can exceed 200,000 kilometers in the future. In new condition, the wheel diameter is 920 millimeters. It can decrease to 850 millimeters after a series of reshaping. The tolerance between two wheels on the same axle is 3/10 millimeters and 20 millimeters between two drive axles.

Number of Maneuvers Cut in Two

The SNCF has had a two-position machine built capable of reshaping the four wheels on a truck simultaneously. The advantage in comparison with the traditional lathe is that the machining time is cut in half, as well as the number of maneuvers.

This method (reshaping truck by truck) is already being used by the Japanese railways in the facilities assigned for Shinkansen trains. However, the Paris-Southeast shops, at Villeneuve-Saint-Georges, did not decide on machining by grinding used by the Japanese, because, although this method makes shallower cut depths possible a priori, and consequently a saving of material, it has two great disadvantages: the need for reshaping the grinders frequently and the impossibility of machining the flange.

The SNCF already has good experience with tool reshaping. Therefore, this solution is the one applied to reshaping on a pit lathe, with four tools working simultaneously on the four wheels of one truck with cut depths from 0.3 to 3 millimeters and a cutting speed of 120 meters a minute. In fact, two carbide tools are mounted on each tool holder, one machining the shape up to the top of the flange and the other the inside face of the wheel. "In addition," Robert Baldocchi stated, "machining is faster than with a grinder and the tool holds out longer. In general, a set of tools lasts for the whole run-through of the train." This result is interesting, if account is taken of the nature of the material: an XC48 steel heavily cold-rolled on a depth of 0.3 millimeters, whose hardness is appreciably 90 daN per square millimeter.

The machine includes all the necessary equipment for moving the wheels along, for measuring the shapes and diameters, for controlling the machining heads, for examining the results and for removing chips. The train is towed by a cart controlled from the machine console. When the truck is in position over the machine, the boxes are lifted by jacks, in order to take a load off the axles. Rollers come up in contact with the wheels and lift them above the tracks. Then the tracks are concealed, making way for passage of the control and machining heads. The shape of the wheel is measured at five points and the results (diameters, differences in diameter between wheels, out of true, flange shape) are transmitted to the digital control computer and displayed on the display unit.

Then the computer determines the amount of machining, taking into account the authorized tolerances on the diameters of the wheels on any one axle and on any one truck. It determines, on the basis of the measured shape, the most economical machining in terms of the pertinent shape program to be obtained.

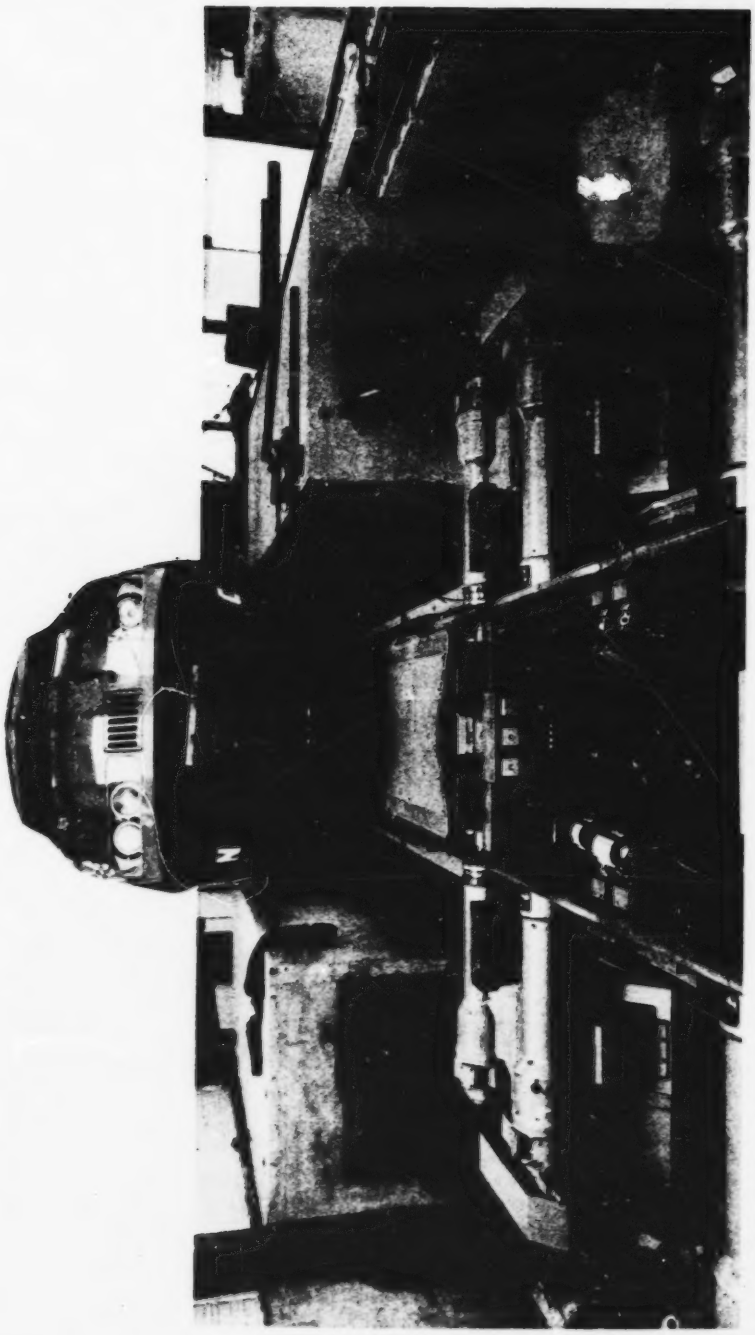
In order to take into account the difference in shape during successive re-machining of the flange, the transverse position of the axle is measured by rollers that rest on the inner surface of the wheels and the program is adjusted consequently. After machining, the machine makes another dimensional examination whose results are displayed immediately and are then recorded by the operators. All these operations take place in a fast cycle. The 13 trucks on a car are processed in 8 hours, the time set by the shop.

Highly Skilled Personnel Needed

This first machine (still the only one in the world) has just been put in service in a special shop, adjacent to the inspection shop built specially for maintaining TGV trains. In view of the complexity of the facility and its connections, it must not be cause for amazement, if its operation raises a certain number of problems for the persons in charge of the shop.

They are optimistic, however, because the prototype machine installed in Venissieux (with only one position) "runs well." A second pit lathe, identical with the first one, installed parallel with it, has just been placed in service.

It is also conceivable that, regardless of how automatic it is, operation of that kind of machine requires the presence of highly skilled personnel perfectly familiar with it. Jean-Claude Daroux, foreman in charge of machine-tools in the Paris-Southeast shop, has been assigned to the technical service, in order to follow up on assembly, in which several production representatives havealso participated. At present, the operators are highly skilled professionally, with special training. "They are capable," Jean-Claude Daroux stated, "of evaluating the condition of the surface before and after the operation and of possibly correcting the computer's decisions."



10,042
CSO: 3102/165

AIRBUS INDUSTRIE SUCCESSFULLY PURSUES ASIAN MARKET

Paris LE MATIN in French 2 Feb 82 p 24

[Article by Jean-Gabriel Fredet: "An Iron Arm Over Asia for Airbus and Boeing"]

[Text] Airbus is hunting on Boeing's grounds in Asia.
An initial accounting: 100 planes sold.

The scene is New York, last 16 December, in the baroque salons of the Plaza Hotel. For the official signing of the biggest contract in the history of his company, J. Pillay, head of Singapore Airlines, brought together the cream of the aeronautical world. Two billion dollars for 8 Boeing 747's and 6 Airbuses: an order that large called for a celebration. The banquet was drawing to a close when Bernard Lathiere, the "seller" of Airbus, made a toast to the health of Singapore and Boeing, his most determined competitor. Muttering with astonishment, T.A. "Tex" Wison, chairman of Boeing, rose to toast the health of Airbus. Excitement-seekers went away empty-handed: the "historic" meeting between the two adversaries was almost a friendly one.

At least it seemed that way. Boeing would have gladly done without Airbus to build one of the most powerful transportation companies in Southeast Asia. As for the "damned Europeans," they are champing at the bit. It is very hard to make the breakthrough in the Asian market that will shake a little more the formerly unrivaled hegemony of the foremost airplane builder in the world.

The number one objective of Boeing and Airbus is to conquer the Asian market, sell to India, Korea, Indonesia or Japan the planes they need to tie their countries or islands together or decompartmentalize their economies, replace the old DC-9's and the short-winded Boeing 727's or Fokker 28's with more kerosene-economical planes capable of transporting things farther, faster and cheaper. They have no qualms about seeking complete domination of the market, now that Lockheed has opted for military markets and the uncertainties of the Fokker-Douglas alliance are forcing Douglas to play a waiting game. If you land in Hong Kong, take off from Bangkok or stop over in Singapore, you will understand their appetite. The endless chain of landings, swarming traffic and fuselages all in a row of large or middle-sized airlines--yellow for Malaysian Airlines, saffron for Singapore, indigo for Thai, and orange-red for Garuda--show at first sight that here are the big markets of tomorrow.

This is hardly surprising. While the International Association of Air Transporters (IATA) forecasts more losses for the sector of more than $1 billion (at the end of 1981, the equivalent of 56 Boeing 747's were crossing the Atlantic empty every day), Asian companies are still benefiting from favorable trade winds. Southeast Asia and the Far East are just beginning to discover air transportation. That explains the forecasts that the United States' share of world air traffic will drop from half to a third by 1996: it is due to excess equipment as much as to other countries' development; but Asia is now and for a long time will probably remain the champion of economic growth rates. With this year leading the statistics, Hong Kong and Singapore are up 10 percent, followed by Indonesia and Malaysia (up 7.5 percent), Thailand, South Korea and Taiwan (up 6.5 percent), and the Philippines (up 5 percent). It is a total contribution of $90 billion to the growth of the world GDP [gross domestic product]. It is three times that expected from North America and Europe combined. It can only provide a shot in the arm to the development of air transportation and ensure the success of aircraft manufacturers who can offer the right product at the best price. "At present, only 3 percent of the 147 million inhabitants of Indonesia take the plane. If only 1 percent more chooses this kind of transportation, we will have to double our fleet to meet the demand," says Wiweco Sirpono, president of Garuda. This makes Boeing's and Airbus Industrie's mouths water; sales were hard hit by the world recession last year.

The European consortium was the first to step into the breach. "We can now boast of having 12 Southeast Asian companies as customers. We have sold them more than 80 planes, not to mention about 15 options," says Pierre Pailleret, a smiling giant of a man, age 36, who supervises the commercial services of Airbus Industrie in Toulouse. "We don't say we have made a definite breakthrough, but it's not bad," Pailleret adds. He is counting a lot on two strong points: the planes' "low usage costs," which made the first Airbus customers the "best supporters" in the zone, and the "high adaptability" of the A-300 to the network of most of the Asian companies, whose flights average no longer than 360 km.

The chairman of Boeing naturally appears as calm as can be in the face of the competition's success. He insists that the A-300, which Asian airlines like so much, is not really competition for Boeing. Rather, it is a lucky challenger of the DC-10 or the Lockheed Tristar. The twin jet is also better suited to Far East air lanes than the 4-jet models produced by Boeing. Still and all, the foremost aircraft manufacturer in the world is not about to let itself be dislodged from a market that was for a long time an American preserve. There is only one rule: no quarter for the competition.

But American power, which skillfully brings together political pressure, industrial payoffs and commercial volume, does not always win at that game. Of course, Boeing was pursuasive enough with Toa Domestic Airlines last year (it is one of the two domestic Japanese airlines) to have Toa ask Airbus Industrie to delay delivery of its three A-300's for a while. And the purchase of the last 3 planes ordered is not yet definite, while All Nippon recently placed a firm order for 25 Boeing 707's. But in the case of Singapore Airlines, Boeing had to make a deal with the Europeans. The airline's chairman had preferred the Boeing 727 five years ago but one year ago ordered 6 A-300 B4's. And he is seriously thinking about buying the Airbus A-310, which is in direct competition with Boeing's brand new 757's and 767's, in order to handle increased traffic. Even more recently, the president of Garuda, who ordered

9 planes and 3 options, made it known that he was looking very closely at the planned small, 150-seat Airbus (the A-320), 30 of which have already been ordered by Air France. The directors of Airbus Industrie have prudently indicated that the project would not be undertaken unless they were assured that "at least three large companies" would buy it. Besides Delta, which is the only American company that made a profit last year and has an urgent need to modernize its fleet of short- and medium-range aircraft, perhaps one or two Asian transporters will join the French national company to give the green light to a new skybus. In any case, it would be a new step for Airbus Industrie in its acquiring a share of the world aeronautical market. While experts estimate the world civilian air transportation market for the next 10 years at $125 billion and 4,000 planes, the 150-seater market alone is estimated to come to 2,500 aircraft. Of course, this does not mean the end of large aircraft, but in air transport, too, "small is beautiful."

Airbus: Shock Sellers

Name: Fritz Winkelmann. Profession: sales director for Airbus Industrie for the Philippines and Indonesia. Age 39. Nationality: German. But he is married to a Spanish lady, and his two children go to school in Toulouse, where he himself lives for the 6 months of the year, on the average, that he is not out on his Asian territory. Fritz Winkelmann is one of 4 first-line salesmen (2 Englishmen and 2 Germans) that the consortium has hired to make its breakthrough in the Far East. Fritz answers directly to an Indian, age 35, and has been working for Airbus since 1975. Previously, he had been an employe of a subcontracting company of MBB [expansion unknown], in Hamburg. What about the 17 aircraft he has sold in the Philippines and Indonesia? "It's the result of a lot of patience, hard work and family sacrifices." "I've always distrusted Boeing's song and dance," says Fritz, who admits that his great obsession is to beat the Americans. He is afraid of one thing, that the age of "pioneers" will be followed by that of desk jockeys. For this outstanding salesman, the war is obviously not over.

[Table] Airbus Industrie's Score in Asia

(1) Companies (2) Firm orders (3) Options

LE PALMARES D'AIRBUS INDUSTRIE EN ASIE

(1) COMPAGNIES (2)	Commandes fermes	(3) Options
China Airlines	4	
Garuda Indonesian Airway	9	3
Indian Airlines	10	3
Korean Airlines	8	
Malaysian Airline System	4	
Pakistan International Airlines	4	6
Philippine Airlines	5	
Singapore Airlines	12	
Thai International	12	2
Toa Domestic Airlines	9	
Trans Australia Airlines	5	2
TOTAL	81	16

8782
CSO: 3102/151

AIRBUS A 310 WILL COMPETE WITH BOEING 767 FOR MARKET

Paris LE FIGARO in French 17 Feb 82 p 9

[Article by Pierre Kerlouegan: "A 310 Airbus--The Answer to Boeing"]

[Text] The European A 310 Airbus, which will make its first flight in 6 weeks, was officially presented yesterday to the officials of the airlines which have ordered this aircraft. The ceremony took place in Toulouse, sponsored by Swissair and Lufthansa, which made it possible to initiate construction on this new model by signing the first two contracts (70 planes in all, half under option) in the spring of 1979.

Designed to carry between 200 and 250 passengers, depending on the interior outfitting of the passenger compartments, the A 310 is a large short- and medium-range transport plane propelled by two jet engines housed beneath the wings.

To date, there have been 88 firm orders for this airplane, along with 50 options taken by 14 companies, including Air France (5 + 15). The maiden flights of the first of these planes is planned for the spring of 1983, i.e., 8 months after the launching of the Boeing 767, the only competition for the A 310 on this market, for which there have been 311 orders and options (173 plus 138).

A comparison of the order sheets for these two aircraft, the world market for which is estimated at some 1500 planes for the next 12 years, makes evident that for the time being, the A 310 has fully achieved the goal established for the overall production by the officials of the European consortium manufacturing the aircraft: winning between a quarter and a third of the world market.

But it would be a mistake to celebrate too soon, because the profitability of a program depends on the number of planes sold and not on a theoretical ratio between their own production and that of competitive aircraft.

Now the limited increase in air traffic in the past two years--one percent last year as compared to an average of 10 percent over the preceding decade--urges carriers to be cautious.

Although we cannot name any companies which are cancelling orders, some are known to be seeking to reduce the orders placed or to postpone delivery of planes for which they have no use for the time being. This is true, for example, of American Airlines, which is trying to reduce its order for 50 767s, 20 of them on option. It is also true of the Dutch KLM and the Japanese TDA, which would like to slow the rate at which their airbuses are delivered.

According to a survey made in this connection by Boeing, which has just reduced its estimate of the market for civilian aircraft worldwide for the next 10 years by 14 percent, this caution on the part of transporter is likely to have to do mainly with heavy transport aircraft, a category which includes the 767 and the A 310.

If the market is likely to be smaller than foreseen earlier, competition will become keener. It can be expected that sale prices and credit conditions will be the subject of even more intensive discussion than previously, for it is often on such negotiation that the fate of a contract rests. Naturally, the technical characteristics of each aircraft come into consideration as well, but doubtless to a much lesser extent than one might think, insofar as the carriers have a natural inclination to retain the same supplier--an attitude which favors Boeing over the Europeans--and also they are choosing between two planes the operational results of which will probably differ little.

Two Man Crew

As the Europeans wanted, the small airbus owes a great deal to its predecessor, the A 300, from which it is derived, although this does not mean that there are not substantial differences.

In addition to a shorter fuselage--47 meters instead of 54--the A 310 has an entirely new wing design. The wing structure is smaller and thus lighter than that of the 767. This is an advantage for the European plane, which weighs 3 tons less than its American competitor, a feature from which it will benefit on short runs, that is to say up to 2500 kilometers.

Another advantage lies in its diameter, which with an additional width of approximately 60 centimeters, allows the placement of eight seats per row on either side of two aisles, instead of the seven with which the 767 is equipped. In addition, in the baggage area, two containers can be accommodate forward, in comparison to the one on the American aircraft, an aspect of some interest to the shipper.

The A 310 Airbus will be certified to fly with a crew of two, without a navigator-mechanic. In the cockpit, all of the instruments are consolidated in front of the pilot, this was made possible by the introduction of computer equipment, cathode tubes and push-button integrated display units.

The majority of the client companies have already expressed their preference for two-man crews, with the exception of Air France, which at the insistence of their navigating personnel, opted for the traditional three-man crew cockpit.

Finally, as was true of the A 300, the little A 310 may be produced in several variants, among others a long-range model with a 6,000 kilometer flight range, which is also planned by Boeing for the 767.

A study of the order sheets for the two planes shows that in Europe, the Airbus has put an obstacle in the path of its competitor. In fact, there have only been four firm orders and five options taken by two charter flight companies in Europe for the 767.

Thus it is by relying basically on its domestic market--197 orders and options to date, out of a total of 311--that Boeing is guaranteeing satisfactory development for this program.

Expanding the Family

The A 310 Airbus, for its part, has won acceptance in Europe, which is its "domestic market" in a way, with eight carriers deciding to purchase it. Elsewhere, its success has been slower but widely distributed, because it has customers in Canada, Africa (Libya and Nigeria), the Middle East (Kuwait and Lebanon) and in Singapore.

Taking all models together, the Airbus family has surpassed the 500 mark for orders and options and is thus approaching the profitability level, which can be estimated at about the 800th airplane, in other words about 3 years away.

But the family is to be further expanded in order to guarantee wider acceptance on the world market for the range of models. New designs are not lacking, and it is very possible that in a few weeks time, the launching of a small Airbus with 150 seats, the specifications for which have been jointly defined by the manufacturer and six airlines--the A 320--will be announced.

Air France has already made known its needs, which total 50 airplanes. Other carriers, including Delta Airlines in the United States, have showed interest in a plane with such a capacity, the world market for which is estimated at 3000 aircraft between now and the end of the century.

If it is to be put into service in the autumn of 1982, work on the A 320 will have to begin speedily, even though the engine manufacturers do not yet have the jet which will make this aircraft definitely more economical to operate than its competitors, the Boeing 737-300, and, possibly, an airplane manufactured by McDonnell-Douglas.

The cost of its development is estimated at 2 billion dollars, which is to be supplied basically by the partners in the European consortium. But foreign contributions will be necessary, and it is reported that Australian and Canadian industrialists may participate in this program to the extent of 3 percent and 10 percent, respectively.

Without denying the desirability of launching this aircraft now, Herbert Kulman, head of the Lufthansa board of directors, nonetheless pled the cause

in Toulouse yesterday of a long-range Airbus with 200 seats to replace the 707s and DC 8s. "Currently, there is no successor to these planes," he said, "and a number of countries throughout the world, even small ones, need them. This would be an opportunity for the Airbus to effect a definite penetration of the long-range market," he added.

But even prior to the expansion of the "family," the acceleration of production of the A 300 and A 310 aircraft is proceeding consistently with the established schedule. The rate of production is 4.2 airplanes per month at present and it will reach 8 per month by 1984, with the possibility, if circumstances so require, of increasing it to 10. Simultaneously, the number of jobs offered by the European manufacturers of the plane is increasing gradually, and it is estimated that the total should come to about 40,000--including 14,000 in France--by 1985.

The Figures for the Aircraft

Wing span	44 meters
Length	47 meters
Maximal weight on takeoff	132 tons
Maximal freight load	32 tons
Number of passengers	from 200 to 250
Freight hold volume	108 cubic meters
Unit thrust for the two jet engines	Nearly 22 tons
Curving speed	840 kilometers per hour
Operational range	4800 kilometers
Runway length for takeoff	1850 meters
Runway length for landing	1660 meters
Price	50 million dollars

5157
CSO: 3102/176

FRENCH AUTO MAKERS, OTHER EUROPEAN FIRMS COOPERATE ON R&D

Paris L'USINE NOUVELLE in French Supplement to 11 Feb 82, pp 10-11

[Article by Georges Le Gall: "Automobiles: Accelerating Research"]

[Text] We had a hint of it when Renault conducted an equipment inventory at the beginning of 1981; we are sure of it, now that the other French builders, Peugeot and Unic, have also taken stock: in terms of robots, the French automotive industry is not less well equipped than the Japanese industry. On 30 June 1981, Peugeot, Renault, and Unic had very exactly 16,898 robots: 2427 manual manipulators, 8777 fixed sequence robots, 5325 programmable sequence robots, and 369 intelligent robots. Let us then hope that the myth that robots were counted by the dozen here and and by the thousand there, will definitely be put to rest among other false notions.

Similarly, the recent study conducted jointly by the Union House of Automotive Builders and the Federation of Equipment Industries for Vehicles, shows that the French automotive industry has nothing to be ashamed of in terms of research. In 1979 (the last year for which detailed statistics are available), car makers and equipment manufacturers employed 15,130 people (of which 2288 were engineers) in their research and development divisions (or 3.8 percent of their total personnel), and allocated 3.5 billion francs (or 3.5 percent of turnover) to them. This represented 11.4 percent of the entire research and development effort of all French industry, a rate quite comparable to the ones reported for the other large manufacturing countries (12.8 percent in Japan, 11 percent in the United States, and 11.8 percent in West Germany).

From 1975 to 1979 the numbers of the research personnel increased by only 10 percent, but the allocations have more than doubled in current francs, which considering the lower value of the money, corresponds to a real growth of the order of 40 percent (the gap between the increases in personnel and budgets actually corresponds to a greater cooperation of the industry with outside organizations such as CNRS (National Center for Scientific Research), engineering schools, universities, technical centers, and so on).

The budgets are distributed as follows: 1 percent for basic research, 22 percent for applied research, and 77 percent for development. While recognizing the importance of the other product objectives (safety, comfort, noise and pollution control, reduced maintenance costs), and production goals (cost reduction, improved working conditions), it is obvious that since the massive oil price increase of 1973, the primary task is to succeed in producing cars with smaller appetites. And it is equally as clear that for the short and intermediate term, we must not expect miracles from alternative fuels or electric cars.

Make More Economical "Petroleum Cars"

"Petroleum cars" are and will long remain the most numerous. They are therefore the ones which we have to make more economical. Although the progress made in this domain in recent years is far from negligible, we must certainly accelerate our pace. In fact, we have already started. Renault's Eve (Elements for an Economical Car), and Peugeot's Vera (Applied Research Economic Vehicle), whose construction began in 1979 with a contract from the Agency for Energy Savings, were taken on the road in 1981. Their average consumption (combination of 90 km/h, 120 km/h, and city traffic) is 5.4 liters per 100 km, or one-third less than the basic 305 and R18 cars. Beginning in 1985, the production-run intermediate line will take advantage of the work carried out to build these prototypes. But Eve Plus and Vera Plus are already in the shop for 1983 delivery and for new achievements, thanks to a direct-injection diesel engine, to intermittent engine operation by means of electronics, and so on.

The goal for economy-line vehicles is to have an average consumption of 3 liters per 100 km by 1990, without sacrificing passenger room (four persons), comfort, road holding, or speed; Peugeot has met the challenge with a car named Eco 2000, and Renault with Vesta (Economic Vehicle with Advanced Systems and Technologies). As an indication of the problems that have to be solved, we will point out that when fully loaded, Eco 2000 and Vesta will weigh about twice as much as their empty weight, which will be of the order of only 500 kg.

We must not forget that the cars must be mass produced in order to be offered at competitive prices on markets where the competition is merciless. To achieve its ambitious goals, the automotive industry, more than ever, will have to call upon all scientific disciplines; some of these are well known (thermodynamics, aerodynamics, and so on), but others, such as rheology (the study of the deformation and flow of plastic materials) or tribology (involved in braking and lubrication problems), are not.

Under these conditions, the magnitude of material and human resources that are required, are leading--and will increasingly lead—French automakers to cooperate in sharing expenses and avoiding unnecessary duplications in their work.

That is why at the end of 1980, Peugeot, Renault, and the French Petroleum Institute (IFP) created GSM (Scientific Group for Engines), whose program committee includes representatives of the Ministry of Industry, CNRS, and DGRST.

In 1981, GSM undertook eight studies (friction losses, heat transfer, interior aerodynamics, injector jets, initial flame propagation, internal visibility, Raman effect, and an engine which could automatically adapt itself to various fuels) which were assigned to Hydromechanique and Frottement, IFP, Ecole Centrale de Lyon, Onera, and the universities of Lille, Marseille, and Rouen.

Government Contribution is Quite Small

Also in 1980, Peugeot and Renault joined British Leyland, Fiat, Volkswagen, and Volvo, to establish JRC (Joint Research Committee), which has conducted fundamental research on the following: materials data bank, internal combustion, heat transfer, interior and exterior aerodynamics, friction phenomena, durability of materials and structures, non-destructive testing technology, and computer-aided design.

Automakers and equipment manufacturers fully agree that they bear the essential responsibility for financing research and development efforts. But they also agree in considering the state support as being quite small (less than 1 percent). They have therefore asked the government for "a stronger financial assistance for the non-specific or general interest studies that they undertake."

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CSO: 3102/172

BRIEFS

VOLVO BUYS U.S. ROBOTS--Here is the imported labor which is welding the new Volvo. It is an American industrial robot from Cincinnati which works two shifts to weld bodies for new Volvo passenger cars. There are over 100 new robots made by Cincinnati Milacron on the assembly line in Goteborg. Cincinnati beat out ASEA for the robot business, worth 50 million kronor, in 1979. Why did Swedish Volvo prefer a United States firm to Swedish ASEA? Neither Volvo nor ASEA will answer that question. Neither firm particularly wants the issue to be publicly discussed. But NY TEKNIK has learned that there were several reasons. The Cincinnati robot had better radius of action and lifted more kg--102 against 60 for ASEA. Volvo already had hydraulic robots with a central robot maintenance system. And Cincinnati's robots are hydraulic, while ASEA's are wholly electric. Cincinnati's control system was better developed than ASEA's. Furthermore, the American authorities prefer that foreign automobile manufacturers who export to the United States utilize American subcontractors. In the background is a threat of limiting automobile imports to the United States. This episode does not mean that ASEA is cut off from the Swedish automobile industry. There are almost 50 large and small ASEA robots in Volvo factories, including Kalmar and Koping. Furthermore, the Wallenberg company Saab purchased a large number of robots from the similarly Wallenberg dominated ASEA. Bjorn Oskarsson, head of the new ASEA sales company, complains that Cincinnati "stole" the Volvo order, but adds, "It has since been proved that we are doing well in world competition without the help which the Volvo order would have undoubtedly provided. For example we have sold over 100 robots to BMW and the Karmann factory in West Germany. We have also sold to automobile manufacturers in the United States. [By Goran Lundstrom and Norbert Andersson] [Text] [Stockholm NY TEKNIK in Swedish 4 Feb 82 p 4] 9287

CSO: 3102/191 END

JPRS 80599

19 April 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 100

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JPRS 80599

19 April 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

No. 100

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FRANCE: ADVANCED INTEGRATED-CIRCUIT-MANUFACTURING EQUIPMENT

Paris L'USINE NOUVELLE in French 21 Jan 82 pp 69-71

[Article by Claude Amalric: "Integrated Circuits: Herewith the French Machines"]

> [Text] Two steppers, a plasma etcher, a high-speed masker, diffusion kilns, and soon an ion implanter. The French integrated-circuit-manufacturing industry is now born. And straightaway, it seems to be performing very well.

In 3 years, an industry has come into being in France: That of the highly specialized machines that are indispensable to the manufacture of integrated circuits. Without them, a French electronics industry is out of the question. For, to be competitive, we must be able to offer the most advanced technology, with circuits manufactured at high speed and without too many rejects. The makers of these machines, until now principally the Americans and the Japanese, have been reserving their first machines to their own national manufacturers, claiming as the reason, which is partly justified, the need to perfect their machines in their home markets. The result is that the machine does not become available to other clients until the world markets have been cornered by the first to whom they have been made available... Hence the importance of developing such an industry, which was well provided for in the previous Administration's "components plan" and which, according to all statements of intent, will be heavily backed by the plan that is to follow.

What has taken place so far represents the initial tangible effects of this policy at this time. At the end of November of last year, CIT-ALCATEL [International Telephone Company - Alsatian Company for Atomic, Telecommunications and Electronics Construction] unveiled at its Annecy plant its GIR 200, an RIE [Reactive-Ion Etching] machine capable of etching image traces 1 micron in width under normal production conditions. It was time: In 1981, the standard went down to less than 2 microns for the highest-density circuits. By the end of 1982, it will be down around 1.5 microns. "The investment in machines, which absorbed 50 percent of the credits allocated to the 1978 components plan, will have to be renewed entirely this year. For, this equipment has a useful life of 3 years," says Jean-Jacques Bessot, head of the thin-layer machines division of CIT-ALCATEL. The cost

of the GIR 200: 800,000 francs. "That is 20 percent less than the American competition's cost." This is fortunate, in that, "To sell abroad, it is first necessary to have clients in the United States. That is the reference point." MHS [MATRA [Mechanics, Aviation and Traction Company]] Harris, however, will be the first purchaser of this equipment, which was built to that company's specifications. The second buyer will be EFCIS [expansion unknown]-Thomson: Another French firm.

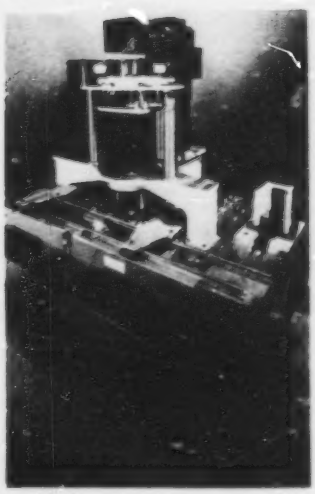
The etching of lines 1 micron thick is very difficult. Indispensable to it is the mastery of vacuum techniques, of materials resistant to corrosion by manipulated gases, of accessories such as electromagnetic sluices, flowmeters, etc. This is why the AEC's [Atomic Energy Commission] LETI [Laboratory of Electronics and Data Processing Technologies], which had released the basic study, wanted to have CIT-ALCATEL, which specializes in all these domains, actualize the industrialization phase. The dry-etching technique used in the GIR 200 is a state-of-the-art technique that is not yet in widespread use in the production sector, which still strongly favors "dip and wash" acid-etching methods comparable to those used for integrated circuits. It is one of the extremely few processes, however, suited to the etching of sub-micron details. Therein lies its attraction and that of the ALCATEL machine.

Another type of machine, mastery of which is considered a prime requisite, is the wafer-stepping photoreducer ["stepper"]--a name that designates its function: Starting with a mask to the scale of 5 or 10 of a circuit to be reproduced--a connecting layer, for example--the machine mates one after the other the etched layers containing the integrated-circuit chip patterns pertaining to a single silicon wafer. A 4-inch (100 mm in diameter) wafer thus contains 81 chips. A mere statement of the task to be accomplished is in effect a statement of the problems to be resolved: The image resolution involved requires a very special wide-angle optical process capable of covering more than 1 square centimeter of image without distortion. This is another fortunate circumstance for French industrialists seeking to produce steppers: One of the--if not the--world's most highly qualified specialists in this field is CERCO [expansion unknown], which for a long time received backing from the DGRST [General Delegation for Scientific and Technical Research] in this research, without immediate fallout at the time. But the principal difficulty of a stepper is the X-Y displacement of the table that holds the wafer. For optimal production output, this displacement along two axes must be the fastest possible despite the final precision requirement: 0.1 micron! It is the manner of achieving this that most differentiates, at this time, the machines of this type.

Composite Materials to Improve Displacement Times

CAMECA [expansion unknown], a Thomson-CSF [General Radio Company] subsidiary, is in the process of putting the finishing touches on a stepper the prototype of which is to be delivered to EFCIS [expansion unknown] in April. Gerard Coussot, CAMECA's director of sales, is proud of his product: "The approach to the alignment problem is original. Instead of having positioning marks that take silicon space away from the circuits, we have placed them between the chips, over the future sawing notches." The result is a space gain on the wafer. Moreover, the

Plasma etchers are still rare. The future is theirs. CIT-ALCATEL's GIR 200 is among the best-performing.



Steppers are among the most difficult machines to build. Euromask, a newcomer, appears to have achieved a masterpiece with its Eurostep 2000.

fine adjustment of the positioning is obtained by means of a laser interferometer. The disadvantage is that the required precision is assured only by processing in a controlled atmosphere surrounded by a special enclosure. Two competitors--Philips and CGA [General Automation Company]--also use interferometry. To overcome the constraints imposed by the system's sensitivity to environmental conditions and by its low thermal inertia, the American company Optimetrix has deposited a metallic grid on a thick glass plate. This grid, fixed under the X-Y table, is displaced by the latter. A fixed microscope reads the reticle, which moves past it.

"It is a good system," says Paul Tigreat, a longtine user of such equipment and now director general of Euromask, a subsidiary of MATRA (but not of MHS) for such machines, "but we do even better!" Paul Tigreat is favored by a third "fortunate circumstance": Even more so than was the case with the CERCO lenses, Jobin-Yvon's holographic grids appeared to many scientists to have no evident usefulness when the DGRST was financing their research. The fallout is now the following: By means of a cross-hatched holographic lattice, Euromask's engineers have replaced the Optimetrix grid, preserving at the same time the measuring system's insensitivity to the environment--hence, no controlled atmosphere.

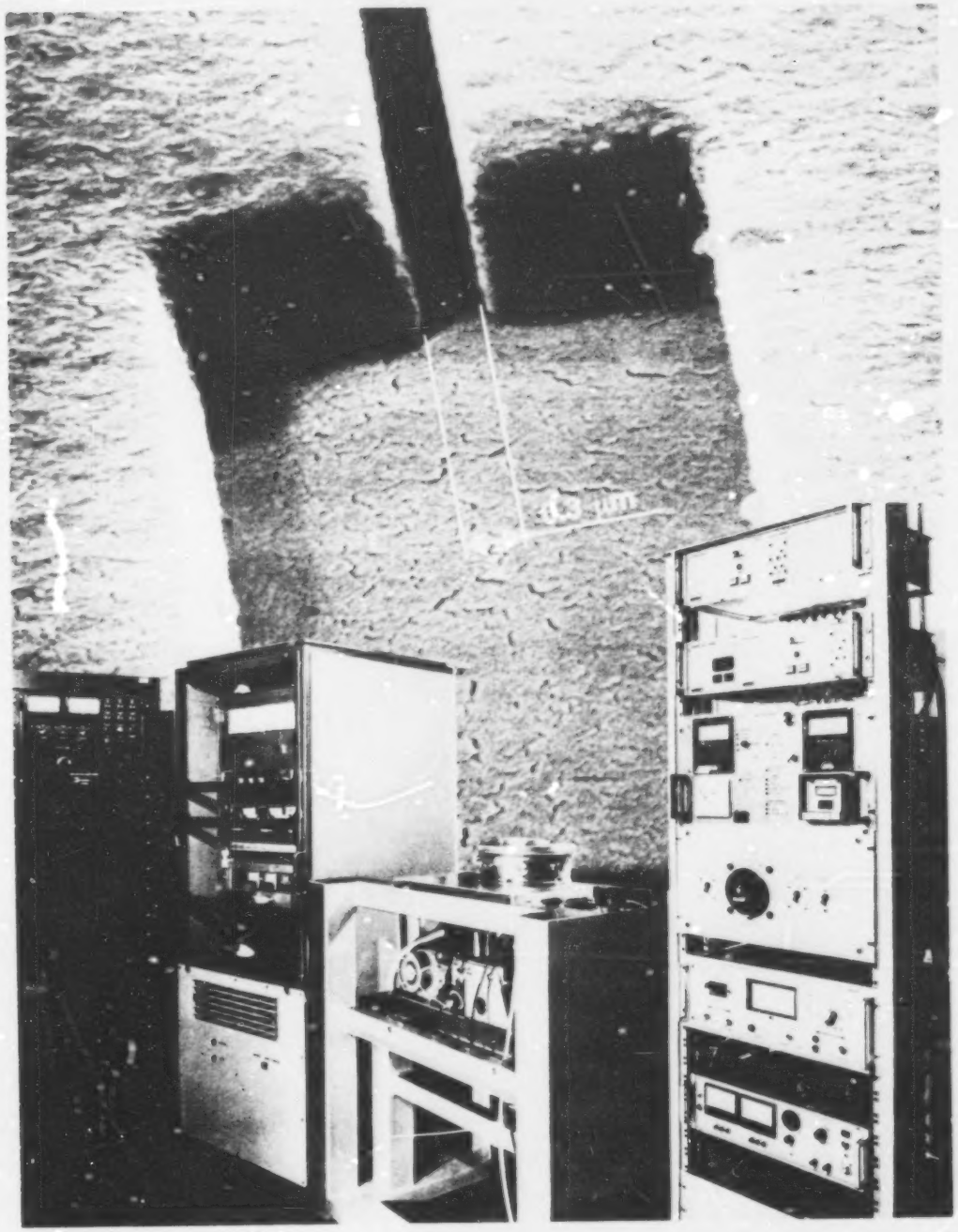
To capitalize further on his advantage, Paul Tigreat has called upon the past experience of his deputy, the former director of methods for MATRA Automobiles. "Besides an entirely fresh viewpoint, he has brought us some ideas the experts do not think of. For example, to shorten the displacement time of the table, which nevertheless must be very rigid, he suggested the use of composite materials. Excellent!" Thanks to this solution, the Eurostep 2000 table is expected to be able to take a 1-cm step in 200 milliseconds this year. The current time of 250 milliseconds represents the best performance of its competitors.

"We are also working on an exposure time of 60 milliseconds versus the current average of 200 milliseconds for our competitors." This gain has resulted from the position in which Euromask found itself of having to build its own illuminator. "Initially, I wanted to buy this subassembly from a well-known Los Angeles supplier. The deeply discouraging terms offered us by the supplier, as to price as well as delivery, conveyed a very clear message: No sales to foreigners. I clearly understood then the name of the game; and within the delivery time that had been quoted us, we studied and built our own illuminator..." Something to think about.

The Euromask stepper will also be delivered to its first clients (MHS and the CNET [National Center for Telecommunications Studies] at Meylan) this spring. The price of a machine is of the order of 3-4 million francs, and each production line of an integrated-circuit manufacturer, to be properly equipped, requires four of these machines.

An Absolute Record: Ten Masks Per Hour

The masks themselves are produced by another machine called a "high-speed masker" in view of its rate of output. Indeed, for this delicate operation, 30 minutes



New machines for the production of integrated circuits must have a precision of the order of 1 micron. Research on the next generation, however, requires working in the submicron range. Hence this X-ray machine developed by CAMECA.

per mask is not too long. But CAMECA has also announced a winner with its electron-beam masker, which is truly a high-speed one, in that it can produce 10 masks (1-micron resolution) per hour! An absolute record. The sole French firm specializing in this equipment, CAMECA will deliver its first FTPG [expansion unknown] at the end of January to the LETI in Grenoble. Another one will be sold in September 1982.

CAMECA, which a few years ago failed to come up to expectations, has suddenly awakened. In addition to the two above-indicated machines, CAMECA is now bringing out an experimental apparatus designed for laboratories. The XPWS 301 is an X-ray stepper capable of etching lines 0.1 microns thick in the photoresist of a wafer. This involves a positioning held to within 0.02 microns approximately... "Therein lies the entire difficulty with this equipment," says Gerard Cussot, "which is why we prefer to sell only the table and its operating mechanism."

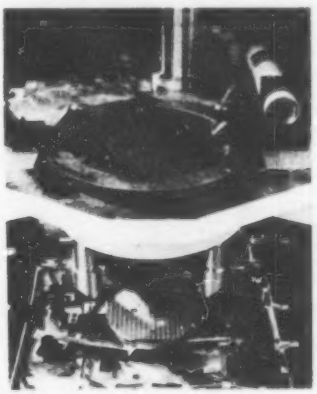
Flanking the subsidiaries of large groups, such as CAMECA and Euromask, very small enterprises are fitting themselves into the market niche for integrated-circuit machines. This is the case with Seirat, at Louverne, near Laval. Formed 18 months ago, this enterprise custom-builds automatic test equipment to specifications for multilayered hybrid circuits, a domain in full evolution that has been neglected to date by such as GENRAD [expansion unknown] and Teradyne. But above all, Seirat has a contract with the DIELI [Directorate of the Electronics and Data Processing Industries] and the DAII [Directorate of Industrial and International Affairs] for the study of an ion implanter, another machine that will have to be built in France. "The implanter becomes necessary when we come down to 1 micron and less," says Jean-Claude Roland, director and creator of Seirat. "Ours will be highly automated. It will moreover be able to process 13 wafers 6 inches (150 mm) in diameter at a time." Automatic loading-unloading, routines on floppy disk to avoid operator error, low heating of boards to less than 150 degrees C (versus 500 degrees C with non-automated implanters), thus eliminating processing stages, are the main features of this equipment, which should be ready by the end of this year and marketed in 1983. Apparently, Serait will then be the sole European maker of ion implanters, with a more advanced machine than any known to be forthcoming. Having started up with two persons, Jean-Claude Roland plans to employ 80 persons by 1985.

At Montpellier, Semy Engineering builds diffusion kilns. Although less critical than a stepper, these kilns are no less indispensable to the production of integrated circuits. Here again, the enterprise is a recent one: Its creator, Yvon Pellegrin, formed it in 1980 with a stack of orders already in hand that assured its future. For, like Paul Tigreat, Jean-Claude Roland and all those who are entering this niche, Yvon Pellegrin has a long past as a user of the machines he builds.

The year 1982 will thus mark the real takeoff of this new industry. A good base for the new components plan being drawn up.

One-Tenth of a Micron Without Constraints

Laser interferometry is known to those who must measure very small displacements or where it becomes necessary to know with a high degree of precision the position attained. Since laser interferometry has been the sole means of achieving the required precision, its users have accepted its constraints. Among its principal constraints are the following: The variation in laser wavelength with changes in environmental parameters imposes the need for controlling the atmosphere in which the equipment operates. Furthermore, the possible increment cannot be other than a submultiple of the laser wavelength, and not a metric unit. All these constraints have been eliminated by Euromask, which has replaced the laser interferometer with a holographic lattice on the X-Y table of its stepper. The precision remains the same: 0.1 micron over a displacement of 15 cm. And its equipment features a set of characteristics that can offer a solution to industrialists not concerned with microelectronics. "We are prepared to discuss their problems with those who might be interested," says the president of Euromask, Paul Tigreat, who thought of this solution himelf.



Use of a holographic lattice has endowed the table of this stepper with a set of astounding characteristics.

9238
CSO: 3102/158

FRANCE PLANS LONG-TERM, SYSTEMATIC SOLAR RESEARCH

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
5 Feb 82 p 7

[Text] In West Germany, the French nuclear energy program is well known; it is being completed without interruption. This is being done with a research expenditure about 30 percent smaller than in West Germany. It is forgotten that France also provides considerable govern ent funds for nonnuclear energy. The French national research expenditures for 1982 compare to 1981 as follows:

National Solar Energy Funds for 1982 and 1981 (in millions of Francs)

Year	1981	1982
Total	209.3	309.5
Direct use	72.0	81.0
Biomass	50.0	80.0
Diffusion	31.0	70.0
International projects	20.0	24.6
Information	10.0	15.0
Infrastructure	26.3	38.9

In 1982 the government expenditures for research in France will amount to about 120 million DM and have a nominal 48 percent increase over 1981. Even under consideration of an inflation rate of 15 percent, this means a drastic increase in government aid. It is notable that the emphasis of support in research and development is on biomass utilization. This is completely in contrast to West Germany. The emphasis in the French national solar energy research program is notably different from the comparable German solar energy program. This cannot be explained by the difference in sunshine, but from a different conception on the use of solar energy prevailing in the French Government. This difference in the structure of the research expenditure is also not a result of the new French Government, but was in place even before.

The German concept of solar energy research aid--as conceived by the Federal Ministry for Research and Technology--is directed to research projects which promise quick success. There can be no talk of a long-term-oriented solar energy research in the Federal Ministry for Research and Technology. Quite the contrary, in France efforts are underway on a long-term research with government support.

9280
CSO: 3102/153

LARGE-SCALE PRODUCTION OF SYNTHESIS GAS BY 1984

Frankfurt/Main FRANKFURTER RUNDSCHAU in German 20 Feb 82 p 14

[Article by Dietrich Zimmermann: "Lignite Gas Soon to Return"]

[Text] Development has progressed to the point that in just under 3 years coal gas will again be produced in a large-scale facility in the FRG. In October 1981, the construction of a large-scale demonstration facility was begun on the premises of the Rheinische Braunkohlenwerke briquet factory in Huerth-Berrenrath, a small town on the outskirts of Cologne. The first of four production lines will start operating in 1984, generating 300 million m^3 of synthesis gas each year from lignite for producing methanol. The other three lines will be ready for operation in 1988 if the first installation works as planned.

That this involves more than just a demonstration project is evidenced by the amount of the investment. The first production complex alone will cost about DM 200 million, a sum which must be raised by the firm itself since the Federal Ministry for Research and Technology (BMFT) has already assumed 65 percent of the cost of a pilot plant. Such extensive financial involvement indicates that profits are expected from the facility. Actually, if the gasification facility were put into service today, it would operate very close to the break-even point. According to the unanimous conviction of the experts, the threshold of profitability will surely be crossed in just a few years.

This conviction appears at first glance to contradict the prevailing opinion that at the earliest it will be 10 years before the products from coal conversion will be competitive with the products derived from petroleum and natural gas. However, the contradiction is easy to resolve: In the facility now under construction near Cologne, the material which will be processed is lignite, and compared to hard coal, which is difficult to mine in the FRG, it is so cheap that, for example, electricity generated from it can even undersell electricity from nuclear power plants.

However, it is not just for economic reasons that lignite is especially well suited for gasification. Since it is from a considerably more recent geological period and is more wood-like, its porportions of easily

gasifiable constituents is significantly greater. And these substances, which are released by simple heating, are consequently very reactive.

To generate synthesis gas from coal, the latter must be heated to 900 to 1,000 degrees C, and then flushed with a gasifying agent, a mixture of steam and air or pure oxygen. The carbon combines with the oxygen to form carbon monoxide (CO) which is one component of synthesis gas. The other component is pure hydrogen (H_2). It is generated as the steam decomposes at high temperature into its constituents, hydrogen and oxygen. The oxygen is used to form carbon monoxide and the hydrogen remains free.

The term "synthesis gas" is derived, by the way, from its intended purpose: It is intended for the synthesis of organic compounds. Since for a particular synthesis a definite ratio of carbon monoxide and hydrogen is required, an attempt must be made to come as close as possible to this ratio in the gasifying process. The synthesis gas generated in Cologne is to be transported via pipelines to nearby Wesseling where it will be converted into methanol; thus, part of the tests carried out in the three-year-old pilot plant serve to determine the operating conditions required to generate the optimal gas mixture for this methanol synthesis.

With a height of 32 m, even the pilot facility has impressive dimensions. The cylindrical reaction vessel suspended in a support frame and surrounded by countless pipes and tanks has an outside diameter of 1.5 m and a height of 10 m. In it about 2,200 m^3 of synthesis gas can be generated each hour from 4 t of powdered lignite. The coal dust is carried by carbon dioxide gas to the uppermost scaffold platform from which it falls through several sluice-like vessels in which it is brought to a pressure of 10 bar, the working pressure in the reaction vessel, a fluidized-bed reactor. In the reactor the dust gasifies as it mixes with the gasification medium. The mixing is accomplished by turbulent agitation as the gasifying agent is injected into the vessel under pressure. Part of the coal, about 30 percent, must be burned in the process to maintain the temperature, about 900 degrees C, required for gasification.

The future large-scale production installation will also work according to this modified high-temperature Winkler process. The lignite dust, 280 t per hour at peak capacity, will come from the briquet factory. The four brick-lined fluidized-bed reactors will have a length of about 15 m and an outer diameter of about 4 m; the height of the support frame will grow to 65 to 70 m. Then the resulting synthesis gas will pass through one more conversion unit in which the ratio of carbon monoxide to hydrogen is adjusted to correspond to the exact requirements for methanol synthesis.

At the Union Kraftstoff company in Wesseling, the synthesis gas will be pumped into a pipeline complex which connects with the various gas users. This pipeline is presently supplied by an oil gasification unit. If all goes according to plan, lignite gas, once converted, will replace about 2 million tons of crude oil per year. A heavy oil is left behind by the gasification process. Construction has been planned for a vacuum

distillation facility to convert this residue into such sought-after products as gasoline and light oil.

It is interesting in this connection that synthesis gas was produced until 1964 by the Rheinische Braunkohlenwerke, using the Winkler process. At that time the price of oil dropped to a level where even lignite lost its ability to compete. In the meantime, just short of 20 years, conditions have once more changed in a fundamental way. Lignite can again compete, but of course it is no secret that gas production by the Winkler process was more than doubled by process improvements.

But the firm's development work has not been limited to coal gas production. The construction of a pilot plant for producing methane, or--in more common terms--natural gas, from lignite is in the offing, and planned for 1986 is a pilot plant for the liquefaction of coal--facilities which, like similar projects for conversion of hard coal, are subsidized by the federal government. In all of this, the problem of environmental pollution is in no way neglected. The licensing procedure for the large-scale synthesis-gas facility was able to be completed according to the rigorous regulations of the emission control law. The flue gas emission will be increased only slightly compared to the present situation at the location, and dust emission will be distinctly decreased due to reduced briquet production.

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BRIEFS

FRG, BRAZIL COAL TECHNOLOGY TRANSFER--Within the frame of partnership between the South Brazilian University's Universidade Federal de Santa Catarina in Florianopolis (UFSC) and the Rhine-Westfalia Technical University in Aachen (RWTH), a joint research project on coal technology is being established at the Brazilian University. Since August 1981, nine Aachen scientists, organized by the Bureau for Technology Transfer, have been preparing members of the faculty of the partner university in lecture series for the new research department. A seminar on coal technology was held for about 150 persons from the Brazilian coal industry, the ministry, and scientific facilities. A request of the UFSC to the cognizant ministries requests support of the Department of Coal Technology in the years 1983 to 1985. The request is for Brazilian funds and for funds from the Federal Ministry for Scientific Cooperation in Bonn. The successfully concluded preparation program is a good indicator of cooperation in the request. [Text] [Duesseldorf VDI NACHTRICHTEN in German 15 Jan 82 p 1] 9280

SYNTHETIC NATURAL GAS PLANT--The two companies, Didier Engineering GmbH of Essen and Thyssengas GmbH of Duisburg have undertaken a joint project to produce substitute natural gas from gasification gases by one-step, combined conversion and methanization in a catalytic fluidized bed. For practical testing of this method (called Comflux), a pilot plant is now in operation on the grounds of Ruhrchemie in Oberhausen-Holten; it is planned to be in operation until the end of 1983. This facility is designed to produce about 2,500 m^3 of methane per hour. A mixture of oil or coal-gasification gases from neighboring gasification plants and hydrogen as the additive gas can be used as synthesis gas. [Text] [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 11 Feb 82 p 7] 9280

CSO: 3102/153

USE OF HIGH PERFORMANCE COMPOSITES INCREASING IN INDUSTRY

Paris L'USINE NOUVELLE in French 25 Feb 82 pp 72-78

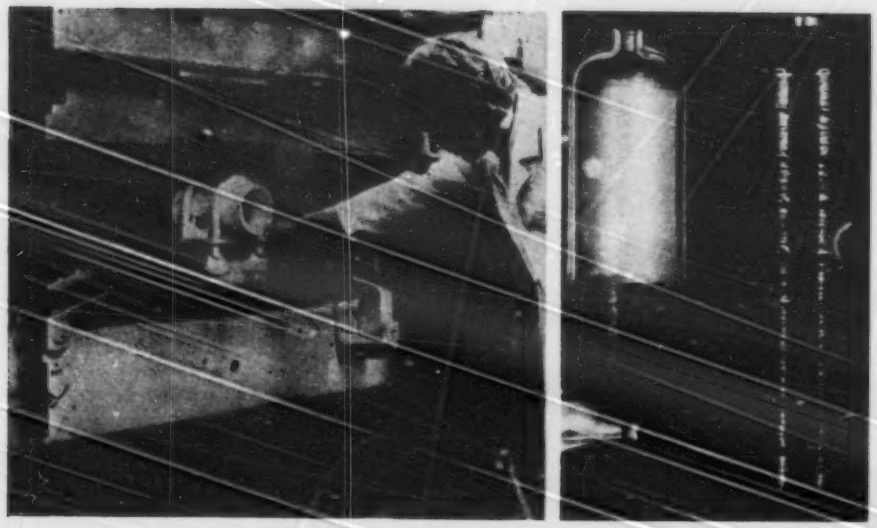
[Article by Pierre Laperrousaz. "Small and Medium-Sized Industries: Think Composites!"]

[Text] High performance (HP) composite materials have made decisive inroads in aeronautics. But their mechanical possibilities are barely beginning to be explored. Their success in this area will depend on the capability of designers to "think composites " the efficiency of technology transfers, the mechanization of processes, and of course, their cost.

In its Basel pilot plant, Ciba-Geigy manufactures and tests driveshafts that weigh 3-4 kg, compared to the 10-12 kg of conventional steel shafts. These parts, some of which have already travelled many kilometers, are made of composites based on epoxy resins reinforced with various fibers: glass, carbon, and aramid. At Snias in Bordeaux, water and mud injection pipes made of glass-epoxy or carbon-epoxy composites, and used for deep underwater oil exploitation, are three to four times lighter than their steel equivalents. At Rubery-Owen in Great Britain, springs with blades made of a glass-carbon composite weigh 25 kg, compared to 90 kg for steel. At General Motors in Detroit, a truck chassis U-beam made of carbon-aramid-epoxy, is 6 meters long and weighs only 46 kg (62 percent less than a metal beam).

These few international examples are as many variations on a theme: the replacement of a metal with a composite which offers equivalent performance with a much lower weight. They take advantage of the essential characteristics of HP composites: exceptionally high strength and specific modulus, combined with great fatigue resistance. As a simple order of magnitude, an epoxy resin composite with a 60 percent by volume content of high modulus carbon fibers, is for equal weight, five times stronger and more rigid in the stiffening direction than a steel weakly alloyed with nickel-chromium. A composite with a base of high strength glass fibers is as rigid and five times stronger than the equivalent steel.

Many more examples of weight reduction through the use of composites are available, even if not all of them have reached the industrial stage. MBB in Germany, has built 25-meter long windmill blades out of glass-carbon-epoxy. In France, the Composit HP company in Salaunes (Gironde), is getting ready to market before the end of this year, compressed gas bottles consisting of a light alloy internal shell, reinforced with an outer winding of glass R-epoxy or aramid-epoxy. The performance



[Left] Flection tests on a truck spring at Rubery Owen (Great Britain). It weighs 25 kg, compared to 90 kg for steel.
[Right] Compressed gas bottle (300 bars) manufactured by Composite HP.

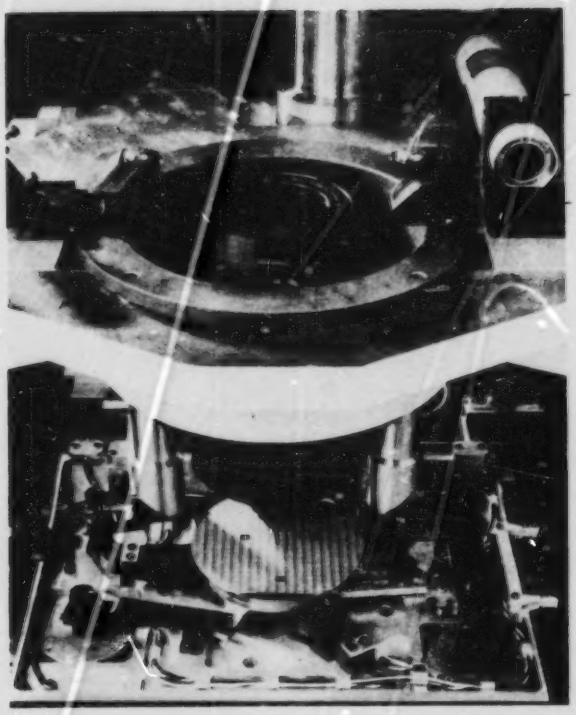
factor (volume of gas transported/weight of bottle) is four times better than that of steel. Such bottles will be used in respiratory equipment, but in the United States they are expected to serve as gaseous-fuel tanks for vehicles. There are even applications which would have been inconceivable without HP composites. One example is the case of flywheels for energy storage: steel would shatter at the speed at which they spin (up to 60 000 rpm).

However, weight reduction, whose practicality is obvious in transportation applications, is not always the main reason, or at least not the immediate one, for selecting composites.

"We have been using composites for the shuttles of some of our looms for seven or eight years," said M. Deborde, of Saurer-Diererichs (Bourgoin-Jallieu). By replacing a telescoping shuttle part previously made of aluminum, with a carbon-epoxy extrusion, this company was able to increase the width of one of its loom models and speed up its rate from 250 to 350 strokes per minute. Most competitors have since followed suit, especially the German ones. SNPE, which manufactures the extrusion, supplies 25,000 of them per year.

This is an application example in a field where the low inertia of composites combined with high stiffness and dimensional stability, offers very promising development prospects for mechanical parts moving at high speed and with high precision positioning.

A perfect example is that of the X-Y table studied and built by Comelin, which will be used in a forthcoming model of an integrated circuit fabrication machine (wafer stepper) made by Euromask (Meylan). This table supports a silicon slice or wafer,

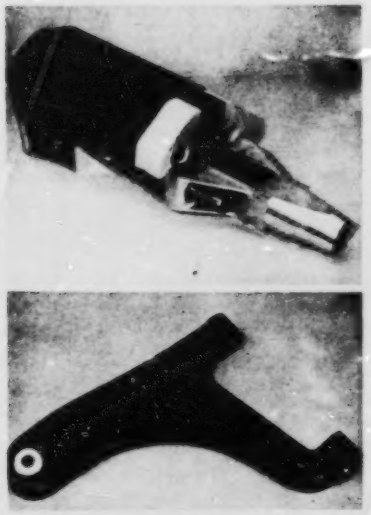


Euromask wafer stepper. The table supporting the silicon wafer is made of carbon fiber composite.

on which as many as 200 circuit patterns are printed. To move from one pattern to the next, the table moves 5-10 mm and is positioned within one-tenth of a micron. "By replacing an aluminum casting with a honeycomb composite sandwich, covered with a skin of carbon-epoxy fiber, the weight of the table was reduced from 20 to 2 kg, and the displacement rate was increased from 5 to 20 cm/s," said Paul Trigreat, director general of the company. The productivity has increased from an output of 30 wafers/hour to 50-60 wafers/hour.

One of the latest Benson drafting table models is of the same type. It includes an aramid-epoxy drum conceived and executed by Bertin. "The drum had to be of large diameter and size, while offering the lowest possible inertia so as to allow high drawing speeds. It also had to be perfectly cylindrical with no deflection at the center," we were told at Benson. The table's drawing speed is 40-80 cm/s (compared to 15-30 cm/s for a conventional tracer), and the acceleration is 4 g. In addition, the drum's greater diameter accomodates stiffer paper.

Also for the same reasons--capability for rapid and precise motion--composites are of interest for production machines such as manipulators, robots, laser cutting machines, and so on. "In order to fully utilize the laser's capabilities for rapid and precise cutting, we will have to revise the concepts of conventional machines. Composites are likely to introduce new approaches," estimates Claude Benedicte, chief executive of Laser Technique. Robot builders are also concerned with the possibilities of composites in their field. The MOC company in Chavignon (Aisne), for instance, has assembled a carbon-epoxy welding-robot head for Renault-Acma: it weighs 3 kg, compared to 6 kg for aluminum.



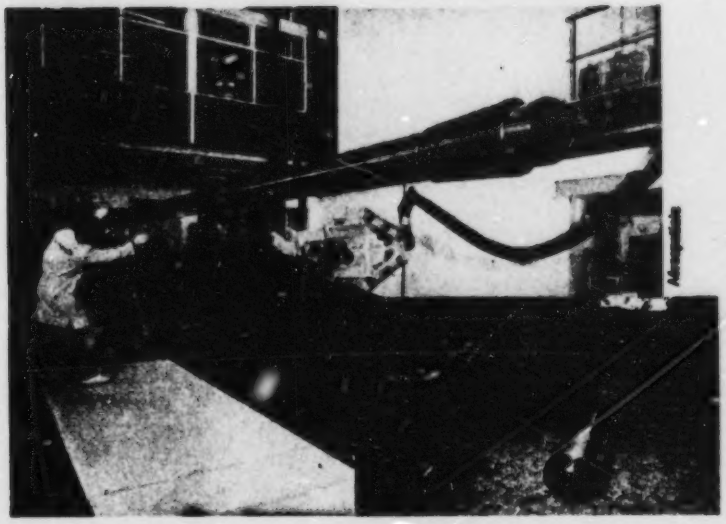
[Above] Carbon fiber extrusions manufactured at SNPE
[Top left] Robot head designed by Moc.
[Bottom left] Automobile suspension arm.

HP Composites no Longer Reserved for Advanced Industries

Secondary properties will sometimes confirm the choice of a composite. One example is the X-ray transparency of carbon-fiber reinforced resins, a property which is exploited in radiology tables (such as scanners), whose cantilevered construction must be very rigid. At other times, corrosion resistance will tilt the balance in favor of a composite, thus opening a vast field of applications in chemical engineering. Carbon or ceramic matrix materials are selected when seeking good mechanical as well as good thermal properties (resistance to thermal shock, for instance). Carbon-carbon composites are thus used in aircraft disk brakes, and land vehicles may be next (TGV, tanks, and so on). Composites reinforced with carbon-silicon carbide matrices (SEP's Cerasep) have been tested in chemical pump rotors.

Beyond their technical implications, these examples show that HP composites no longer apply solely to advanced technologies, but also to industrial parts in general. This observation matches the predictions of professional forecasters. Between 1980 and 1990, the annual growth rate for HP composites in France will be five to six times higher than that of ordinary glass fiber composites (25 percent compared to 5 percent). And according to some estimates, the industrial parts share will be far from negligible: 20 percent of the carbon fiber market in 1985, according to the most optimistic forecasts.

Trends have to be noted even more than figures, because statistical predictions concerning composites vary enormously from one source to another. One does not have to be an aircraft manufacturer or subcontractor to be interested in composites. This should already hold true today in order to avoid being surprised by a technical development which seems inevitable. Indeed, a certain degree of interest, if not anxiety, is becoming increasingly noticeable among industrialists. "There is a very

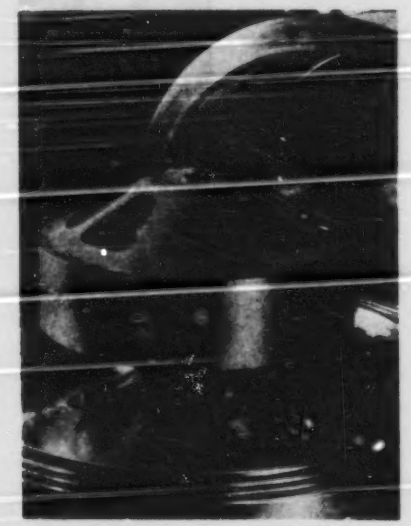


Fabrication of a carbon fiber-epoxy tube by filament winding at Snias (Bordeaux). Four times lighter than steel.

real desire for information," notes Philippe Laroche, head of the Comelin Composite Structures Division (a Matra subsidiary), which for the past year has been conducting a systematic survey of industry with a view to finding new applications. "But their misinformation is evident," he adds.

But the future of HP composites in all industrial fields will depend on the ability of designers to exploit their exceptional properties. Designers often do not think composites, or when they do, it is not with full awareness. "How often have I had to prove to an inquiring industrialist that the composite approach was not mandatory?", regretfully states Gerard Perez, of Fibre et Mica, one of whose activities is filament windings. This is a wise attitude, because composites are not to be used indiscriminately. One single case of poor performance, and their reputation is sealed as far as design specialists are concerned.

The latter are still very strongly oriented toward metals, and for them the special features of composites are fairly disconcerting. Among these features is the possibility of optimizing structures by orienting the fibers along major mechanical stresses. Another is the composites' sensitivity to stress concentration (resulting from the absence of plastic deformation), which calls for caution in the design of assemblies (a rivet or screw hole significantly weakens a part). That is why to think composites often means to also think adhesives. The transition to composites is all the more delicate since it is not limited to a simple substitution of materials. The very concept of the part must be revised, through value analysis if necessary. "It often amounts to a real upheaval for design departments, because established products must be re-evaluated," says Philippe Laroche.



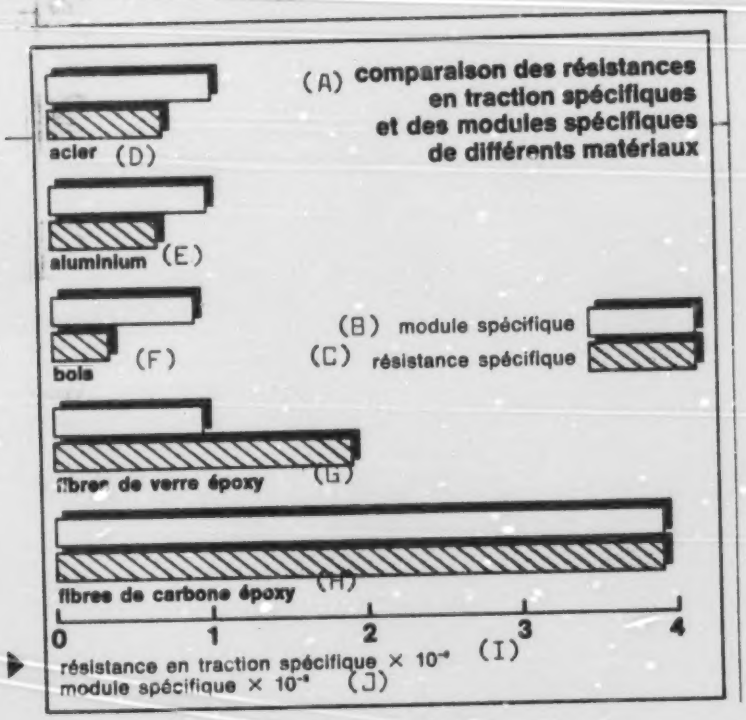
Flywheel for energy storage, made of carbon fibers. It spins at 20,000 rpm.

One Condition: Disseminate Know-How

However, these preliminaries are unavoidable if we are to reduce the additional costs generated by the use of composites, since the unit of performance (stiffness, for instance) is almost fifteen times more expensive with a carbon composite than with steel. Under these conditions, the use of composites cannot become widespread unless the total cost of their integration into assemblies can be reduced by reducing the number of parts (multifunctional parts), and by fully exploiting the possibilities for indirect weight reduction (as in the case of driveshafts which make it possible to eliminate intermediate supports); in other words by completely reexamining the product design.

In order to achieve their 1985 forecasts, enterprises must sit down at their drawing boards right now, because as they say at Ciba-Geigy, three good years are necessary between the time of the first idea and industrial manufacturing. Mr Lucas, of the Courtaulds Research Division (manufacturer of carbon fibers), even promises sweat and tears to composite pioneers. Less lyrical, Philippe Laroche confirms that the development of a composite project requires an enormous amount of time and money. He even goes as far as to ask himself whether "industrialists have the means for their wishes, and if in fact the market is sufficiently ripe." Only the industrialists in advanced sectors, such as aeronautics and aerospace, have the means and competence to design and calculate structures made of composites.

The question is to find out how this know-how will become disseminated throughout industry. Some companies, such as Snias, SEP, and Comelin, have a very open attitude in this respect. "It is in our interest to encourage the development of composites, if we want to see a lower price in fibers," says Aerospatiale. These transfers can be carried out through license sales, joint development projects, or through subsidiaries (such as Composite HP, in which Aerospatiale has a 34 percent interest).



Resin epoxy composites reinforced with carbon fibers (60 percent by volume) are four times stronger and more rigid than steel for equal weight.

Key: (A) Comparison of specific traction resistance and specific modulus for various materials.
(B) Specific modulus
(C) Specific resitance
(D) Steel
(E) Aluminum
(F) Wood
(G) Glass fiber epoxy
(H) Carbon fiber epoxy
(I) Specific traction resistance x 10(-6)
(J) Specific modulus x 10(-8)

Snias, for instance, has assigned the licence for Airbus struts to two of its subcontractors, Sarma and Luchaire, and trained their personnel as well. And SEP has signed an agreement with PSA for a joint study of automobile parts (shafts, springs, suspension arms).

"In this type of involvement, our role is limited to design, prototype and pilot fabrication, and supply of know-how. But there is no question of mass production on our part," states Jean-Pierre Mermillod, head of the SEP Industrial Department. "After a few such operations, the customer's designers are familiar with composites, and can move on their own steam," he adds. As part of a Committee for the

Development of Composite Materials (Codemac) in Aquitaine, the manufacturers of the region (Snias, SEP, Dassault, SNPE, and Elf-Aquitaine), the university laboratories, and the Bordeaux Chamber of Commerce have formed an informational structure aimed at the region's small and medium-size industries (PMI) which are interested in diversifying into HP composites.

This structure would be the embryo of a future French Institute for Composite Materials. It intends to provide industrialists with information (market studies, finished product studies, new applications), training, research, and testing (parts design, materials characterization, and so on). The avowed goal is to create an industrial composites center in Aquitaine.

The development of HP composites will require the adoption of means of production, both in terms of equipment and personnel, in numbers appropriate for the technology that is adopted. The fabrication of laminates by direct impregnation, or starting with preimpregnated materials, is still a cottage industry technique, fairly easy to disseminate, and which requires only moderate investments: presses, autoclaves (10-15 bars).

Some PMI have already entered this field. MOC came to it through motorcycle competition! Its founder, Michel Moch, holds about thirty speed records with motorcycles and side-cars for which he designed and built composite frames. Today he is an industrialist working with automobiles (Formula 1 movable skirts and fins), weaponry, and aeronautics (honeycomb sandwich flooring and partitions). He has 14 employees. Another example is the Brunet company in Haubourdin. Its founder is another former champion (kayak). His accomplishments include kayaks and oars, of course, but also racing car parts (Rondeau fins). The enterprise, which now has 30 employees and a turnover of 4 million in 1981, has just moved into a new 5000 square meter building. Its goal is aeronautics subcontracting.

PMI Are Already in the Breach

"We will start with parts that are not in great demand, molded by direct impregnation, and we will progressively move to more operational structures, molded in preimpregnated form in autoclaves," says Jean-Francois Mouney, administrative director. Of course, the know-how is provided by the one who places the order: "We are not yet able to design complex parts." At MOC, an Apple II computer is used to calculate simple parts. "We are also perfecting a program which, given the mold design, should indicate a layer by layer pattern of preimpregnated materials. This would greatly simplify the shop's work," explains Michel Moch.

Filament winding is also a relatively accessible technique, with investments that are still moderate (200,000 to 800,000 francs per machine). "But while anyone can make windings today, the fabrication of sophisticated parts requires multi-disciplinary knowledge about thermal and resistance properties," speculates Gerard Perez, of Fibre et Mica. Conversely, investments in carbon-carbon or all-ceramic composites are of quite another order of magnitude (at least a factor of 10): very high pressure autoclaves (1000 bars), three-dimensional looms, and so on. These can only be made by fairly large companies. But mechanical industries may quite possibly find new outlets in the machining of these materials, which relies on conventional turning and milling.

According to some estimates, the development of composites should create about 10,000 jobs by 1990, 10 percent of which will be in the higher levels (engineers and technicians). While their recruitement does not appear to create major problems (basic engineering training can be readily adapted), the same is not true for the shop personnel. "The fabrication of composites is not prestigious to a machinist," observes Georges Jube of Aerospatiale (Central Techical Offices). Indeed, no specific training for composites is presently available, and one must use retraining; Aerospatiale is even employing former cabinet makers. At Fibre et Mica, "the best results are obtained with lathe workers, but there is no general rule, and the success of retraining always depends on the individual," says Gerard Perez.

The low degree of process mechanization (as in the case of layering by piling up coats of preimpregnated or non-impregnated sheets) needs a great deal of care: some parts in aeronautics, require the hand layup of several dozen coats, each in a different orientation! For Georges Jube, training in composites must include both some notions of fundamental chemistry (what is a resin? or polymerization? and so on), and of strength of materials (relationship between the strain supported by a part, and the arrangement of fibers). Training clearly plays a large role in Codemac's program in Aquitaine: in-plant training of LEP or LET teachers, training of trainers for in-plant education, and so on).

Cost of materials, designers' ignorance, lack of trained personnel, are not the only obstacles to the development of HP composites. The specification of basic components, fibers, and especially resins, are not yet as well defined as those of metals. And the fact that most of the suppliers are foreign does not simplify matters for the French user. The need for a data bank on composites and on their behavior with time, is being strongly felt. Moreover, there also exists a need for raw materials control methods that are well defined, more industrial, and less expensive than those used in aeronautics (infrared spectrometry, chromatography, acoustical methods, holography), where control comes to represent 20 to 25 percent of the part cost!

Technique Still Limited to Short Run Production

And finally, the low mechanization of transformation processes, and the polymerization time of resins, increase fabrication costs and rule out mass production. "For the time being," says Phillipe Laroche, "the only industrial applications that we envisage concern runs of 10 to 200 parts." In the case of layering, the cutting of sheets has been mechanized with lasers or high pressure water jets. But the actual layering is still manual. Pilot models of automatic layering machines exist at aircraft manufacturers, but are justified mainly by the large surfaces with which they are concerned. The Ingersoll Milling Machine Co. in the United States, for instance, has built a numerical control machine for General Dynamics, designed to fabricate the rudder of the F 16. It lays down 15-cm wide pre-impregnated ribbons, working 15 times faster than a man. Aerospatiale is also studying such machines.

Currently, the only industrial processes are pultrusion and filament winding. Even though at first sight they are limited--the first to cross sections, the second to bodies of revolution--their possibilities are more extensive. Goldworthy Engineering (California) for instance, has perfected a curve pultrusion system which could be used to manufacture car springs or cylindrical structure members. What is

more, the same company is proposing a version of the process which would make it possible to pultrude curved objects with variable cross sections: at the end of the process, the material--still plastic--is brought into dies attached to the sides of a rotating drum. Filament winding also offers extensive possibilities. Thanks to the recent introduction of numerical control, it is used to fabricate parts with very complicated cross sections (hourglass, for instance), and even short runs.

For mass production, specialized machines reach truly industrial rates. For instance, McClean Anderson, in collaboration with Celanese, has built a machine which produces a driveshaft in one minute. And finally, it is reasonable to make parts which at first sight are not bodies of revolution (U-beams, for instance), through filament winding and splitting. Composites with thermoplastic matrices (polycarbonate, polyamide, polysulfonate) also offer an approach to more industrialized processes and higher production rates. Up to now, these materials have been used with short fibers, which is certainly not the best way to use the properties of the latter. But when reinforced with long fibers (woven, for instance) and in the form of hot-stamping plates, they could be of interest for industries in which high production rates are most important.

Forecasts for HP composites must be made with care. The only figure on which all sources agree is that the world consumption of carbon fibers is 800 to 1000 tons/year. Beyond that, the pessimists predict 5500 tons in 1985 and 22,000 tons in 1990. The most optimistic ones, the Japanese, propose 15,000 tons and 50,000 tons, respectively, for the same years. Will the production capabilities be able to keep up? If all the projects announced by carbon fiber producers see the light of day, they will exceed 3600 tons in 1982 (not including a Kureha project for 3000 tons of bottom of the line fibers). And the Japanese, still the most daring, announce 20,000 tons in 1985 (of which 10,000 tons for the bottom of the line).

At first sight, the need should thus be satisfied. But as in the case of every new technology that is starting out, we must expect ups and downs. We will probably witness alternating overproductions and shortages. The problem stands to be worsened by the automotive industry, which remains the major unknown.

A Major Unknown: The Automobile Market

All fiber makers are watching this market with a mixture of hope, because they are convinced of the advantages of their materials, and of impatience with the inertia of this sector. "At least 25 items in cars could be made of composites, with improved technical performances and weight reductions," says Jean-Pierre Gugerli, of Union Carbide (Geneva). To-date, the best prospect is a driveshaft made of glass-carbon-epoxy composite. But no manufacturer has yet made the decision to market it, to the great disappointment of materials producers: "I am waiting impatiently for one of the manufacturers to make that decision," says Mr Gugerli. "We don't care if he is Japanese, or even if he uses the fibers of our competitors! The impact of the car market can quickly turn the capability-consumption equilibrium around, and influence prices." In the downward direction, we hope.

The fact is that these high performance fibers are still very expensive: 300 francs/kg for the cheapest carbon fibers, 100 to 150 francs for aramid, and 100 francs for high-strength glass. Production capacity increases, supported by an opportunity market such as the automobile, should theoretically cause a drop in

carbon fiber prices, although certainly not to as great an extent as in the past (their 1980 price is one-sixth of what it was in 1970!). However, tar based fibers, less sensitive to energy costs, should experience the largest price reductions. The less important aeronautics market will also guide the demand toward other products, particularly rovings, whose number of filaments is higher (15,000-30,000), and whose fabrication cost is lower. But this will entail a change in transformation processes.

Another important question for French users is dependence on foreign markets. This dependence is total for aramid fibers, exclusively made by Dupont de Nemours, under the Kevlar brand (capability of 7000 tons); it is nearly total for carbon fibers, since the only national producer, Serofim (subsidiary of Rhone-Poulenc and Carbone-Lorraine, itself a PUK affiliate), makes only 10-15 tons/year. The situation is hardly brighter for matrix materials: CdF Chimie makes only 2000 tons of epoxy.

It is therefore not surprising to witness the major industrial maneuvers of recent months in an attempt to reduce this dependence.

French Dependence on Foreign Markets

An announced agreement between Elf-Aquitaine, Torray, and Union Carbide for a projected plant with a capability of 360 tons of carbon fiber per year, in the Sud-Ouest, was followed by the announcement of a PUK-Hercules agreement for a 200 tons/year plant, whose opening is scheduled for the end of 1983. In the crush, PUK established a composite materials division. Meanwhile, France is self-sufficient only for glass fibers. Our position is better in the field of advanced technology composites: carbon-carbon composites developed by SEP and Aerolor (subsidiary of Aerospatiale and Carbone-Lorraine); reinforced ceramic-matrix composites from SEP, which has also signed an agreement with Lafarge-Coppee for perfecting new high performance ceramic fibers; and boron-fiber based composites. Although there is practically no market in France, SNPE maintains a small fiber production unit at Bouchet, and is conducting an applications study (especially with aluminum matrices) in order to preserve an already significant technical know-how.

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NC MACHINE TOOLS IN NEW RENAULT FLEXIBLE WORKSHOP

Paris L'USINE NOUVELLE in French 25 Feb 82 pp 88-89

[Article by Patrick Piernax: "Digital Control Invades the Automobile"]

[Text] The investment that the Renault state-owned company has just allocated to modernization of the prototype components machine shop in the Billancourt plant amounts to close to 25 million francs. This decision finds expression in the massive arrival of digital control machines in Department 70. "We have deliberately aimed at digital control, in order to cope with the requirements for capacity, rapidity of execution and availability that are demanded at present of the prototype service," Bernard Hulot, director of central mechanical methods and forge of the state-owner company, stated. He went on to say: "For some years now, modifications of the mechanical components of automobiles have become more frequent (among others, in order to adapt to fuel economy). Moreover, we are witnessing the appearance of new components like the ones needed by diesel engines. Therefore, it was necessary to be capable of furnishing all the components included between the prototype and start of mass production in the shortest time possible."

Other objectives aimed at by the Billancourt plant are, on the one hand, to reduce the cost of components, which are generally high when they are produced by units, and, on the other hand, to limit recourse to subcontracting for reasons of confidentiality.

After 4 months of operation, the state-owned company believes that these objectives have been attained in part: "We are producing prototype cylinder blocks in a period of 2 months, compared with 3 months previously, and we expect to lower that period to 1 month shortly," Robert Riguidel, head of Department 70, stated. He added: "The cost of components manufactured in this new shop has been lowered by 15 to 25 percent for components formerly subcontracted and by 10 percent for our productions."

The new shop consists of two sections. One specializes in machining crankshafts; the other, more general, produces "prismatic" components: in fact, almost all the mechanical parts of a vehicle (cylinder blocks, cylinder heads, manifolds, water and oil pump covers, but also transmission housings, differential housings, without overlooking very different components like suspension arms and steering knuckles).

In order to meet these various requirements, the shop includes three four- and five-axle Graffenstaden CU 21 machining centers, with a storeroom for 60 tools and four Stama vertical drills. These seven machines are equipped with a digital control by means of Renault computers, of course! The shop is supplemented by an Ernault-Somua three-axle milling machine, a Mavilor vertical drill and a Tibo horizontal drill providing the capability of being able to drill 6-millimeter holes on 400 millimeter lengths. All these machines are proving to be capable of answering a variety of problems and of mass producing (from a few units to 500 components).

If taken one by one, these machines have nothing particularly original about them. Their simultaneous operation might have created management problems. The engineers in Department 70 were able to avoid this obstacle by investing from the start in a site for tool preparation and for assembling components. All the preadjustments and assemblage of components are performed in "masked" time. Moreover, the tools (several hundred) are arranged on two Industriever automatic vertical storage racks. What is just as remarkable is that presetting of tools is handled by a computer that puts out a perforated tape, consisting of the characteristics of all the tools set up in a machining center. "When a new component is initiated, the characteristics of the tools by digital control by computer are recorded instantaneously, thus avoiding shutting down the machine for 40 minutes to enter the data by hand," Jean-Marie Militon, assistant head of the department stated.

A Successful Operation Owing to the Training Program

The shop began operating in September 1981. As early as October, the shop was working at full capacity in two shifts (2 X 8). Jean-Marie Militon insisted on pointing out, however, that all the personnel had never worked on digital-controlled machines. He explained the success of the operation by the establishment of an interior training and recruiting program of all the personnel in the shop (a shop boss, two foremen and nine skilled workmen). The two foremen, recruited from shift foremen, received 1,000 hours of training (training in theory at ADEPA [Association for the Development of Automated Production] and practical training under a specialized subcontractor with the supplier of the machines). The operators (of the P3 level or chief technicians) benefited from 450 hours of theoretical and practical training, provided essentially by the central training department of Renault.

Very Valuable Flexibility of Use

This "training" department is going to be equipped shortly with a Graffenstaden CU 100 machining center, in order to handle Renault's increasing needs with regard to digital control. Installation of this shop is included in a general trend toward the use of digital control in the production of automobiles, even for mass production. "We firmly believe in its advantage in mass production machining," Bernard Hulot stated. In fact, although digital-controlled machines offer intrinsically a lower rate of productivity than chain conveyors, they provide a valuable flexibility of use for passing from one production batch to another or for small-scale production of variants of models for export.

Two examples illustrate this trend in the Renault group. In the Cleon plant, the surface of a clutch housing is now milled to shape by two milling machines driven on two axles by digital control (a solution that makes it possible to run the clutch and converter housing on the same position and it allows a new more compact design of the housing with a projecting part). Likewise, in the Mans plant, a machine consisting of two digital-controlled positions with three axles is soon going to replace a chain conveyor unit for producing two steering knuckles with identical hubs but different knuckles. "More generally, we are moving toward a considerable utilization of digital-controlled catalogue machines like machines for cutting gears, production milling machines and, of course, four-axle lathes," Bernard Hulot concluded.

10,042
3102/183

VSS: FIAT'S PLASTIC AUTOMOBILE PROJECT

Helsingborg PLASTFORUM SCANDINAVIA in Swedish no 1/2, 1982 pp 14-15

[Text] In issue 10 of PLASTFORUM last year we reported on Peugeot's project to manufacture an automobile containing as much plastic as possible, the so-called Project Vera. Fiat has also examined the possibility of creating such a car in a project called VSS, which stands for the Italian "Vettura Sperminetale a Sottosistemi."

This project is based on the Ritmo model, a car that already contains much plastic including the front and rear sections which are made of EPDM-modified polypropylene.

The results of this project are interesting but, as usual, it is impossible to produce such a car today, since the production process would be uneconomical and difficult from an organizational standpoint. The economic problems include primarily higher material costs and investments in new forms of production. The organizational difficulties result primarily from Fiat's system of subcontractors.

In general, Fiat's design is extremely simple. The automobile design has been divided into nonvisible supporting structures and visible nonsupporting structures. On this basis, an automobile has been designed with a steel "cage" on which external panels are then attached. Thus, the appearance of the automobile may be changed by quite simply by producing new panels. If only minor design changes are desired, the frame of the automobile may be kept unchanged. In this way, a number of different models may be made on the same frame. This means that the cost of tools and production costs for a frame may be spread over a greater number of finished automobiles and that the assembly time may be reduced by producing complete assembly systems that then may be attached to the frame. This term " assembly systems" appears constantly in this project. The goal is to achieve maximum integration with the fewest possible parts to assemble on the frame.

The VSS design is only an experiment with the body and the frame themselves. In the present stage, no attempt has been made to alter the mechanical or electrical systems.

What then has been achieved by this design? First of all, the plastic automobile is 21 percent lighter. The assembly time has been reduced by 5 hours compared to conventional methods and better noise insulation has been achieved. The design consists of nine different assembly systems that are mounted on the steel frame. The frame has also been simplified as much as possible and it is made of galvanized steel and HSLA steel plates.

From front to rear, the following parts are made of plastic:

Front

The front end is made as a unit consisting of a bumper, equipped with various assemblies, but mounted on tracks so that in a collision the entire bumper is pushed back so that the damage is as minor as possible. The front-end unit also contains a panel with the radiator grill, the air intake, and the headlights. Injection molding is used and the material is polycarbonate, which permits some deformation under stress.

Hood

The four elements that normally form the engine house--the hood itself, the internal supporting parts, and the left and right inner fenders--are combined into a single unit which also contains the ventilation system. The entire hood weighs about 12 kg, compared to about 17 kg for a comparable hood of steel. The hood is made of 3-mm glass fiber reinforced cellular polyester plastic.

Front Fenders

Since the hood overlaps the sides and the front end serves as part of the front fenders, the traditional front fenders consist only of small connection sections between the front wheels and the doors. They are made of 2.5-mm SMC and are bolted to the frame in the final stages of assembly.

Front and Back Doors

Each door consists of two plates made of SMC. The plates are joined at the edges and have a supporting brace of HSLA steel inside. The brace acts as both collision protection and a support for the window mechanism, the hinges, and the lock.

Rear Unit

The rear section of the automobile consists of several plastic panels that are joined together "off-line" and then mounted to the frame as a unit. The floor and sides of the luggage compartment and the back cross member and bumper are two separate moldings of polycarbonate. The back fenders are made of SMC.

Hatchback

The hatchback is a single plate of 2.5-mm SMC which is made stable by installing

the back window.

Roof

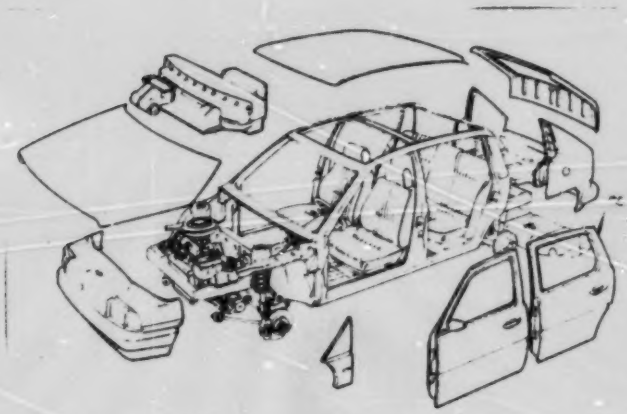
The roof is made of 3-mm cellular polyester plastic.

Instrument Panel

Two individual component systems form the instrument panel. One system includes the heater, air vent, and space for the spare tire, among other things. All this is in one component. This section is completely independent of the inner dashboard which contains instruments, controls, and the steering.

This design means that the ventilation unit provides sufficient insulation from noise and heat from the engine house. Thus, no insulation mats are needed.

This instrument panel design makes it possible to have variations in a single automobile model and instruments and controls may be given a new design without changing the entire appearance of the dashboard. In addition to these parts, like most European cars, this automobile has a fuel tank of polyethylene.

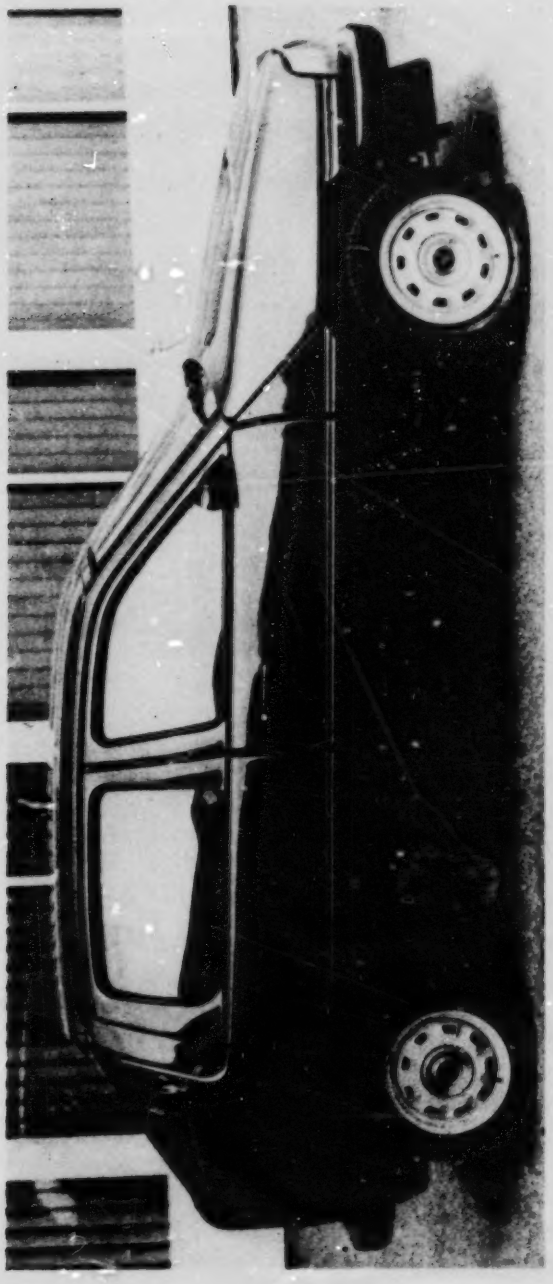


These parts in Fiat's experimental car are made of plastic.

Ritmo and VSS: Table of Comparative Weights

	Ritmo kg	VSS kg.	kg	%
Nonmoving body parts	197.20	159.10	-38.10	-19.3
Front doors complete with inner panels	43.66	29.80	-13.86	-31.8
Back doors complete with inner panels	36.46	29.80	- 6.66	-18.3
Hatchback	19.10	15.30	- 3.80	-19.9
Hood	17.10	12.10	- 5.00	-29.2
Instrument panel	4.80	4.40	- 0.40	- 8.3
Total body weight	318.32	250.50	-68.42	-21.3

Component system	Unsaturated SMC polyester	Cellular polyester plastic	Poly-carbonate	Modified PPO	High-molecular polyethylene
Front panel			X		
Front bumper			X		
External fenders	X				
Floor of luggage compartment			X		
Internal fenders			X		
Rear parts			X		
Rear bumper			X		
Hood		X			
Hatchback	X				
Back doors	X				
Front doors	X				
Roof		X			
Instrument panel				X	
Fuel tank					X



BRIEFS

NEW TIRES SAVE FUEL--Frankfurt, 10 February--Scientists at Dunlop in Birmingham have developed, according to a report in the magazine "Industrial Research and Development (number 12/1981, p 80), a new type of automobile tire which reduces fuel consumption by up to 5 percent. In the opinion of a leading Dunlop manager, this can be considered the greatest step forward in tire technology in the last 40 years. As is well known, fuel consumption can be reduced by lowering the roll resistance of the tire on the road. According to the report, Dunlop scientists appear to have accomplished this without degrading braking power by using a new type of polymer. The director of the tire test laboratory at Dunlop, Geofrey Morton, said in this connection that the problem was to discover a material which absorbs less energy while rolling but which absorbs more when skidding. The idea was that the problem could be solved by a mixture of materials which individually need not be at all suitable for the road-contact surfaces of tires. According to the test results reported by Dunlop, the fuel consumption of a 1.3 liter Austin Metro equipped with the new tires was reduced by 5.2 percent. [Text] [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 11 Feb 82 p 7] 9160

CSO: 3102/177 END

JPRS 80654

26 April 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 101

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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JPRS 80654

26 April 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

No. 101

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BRIEFS

PRODUCTION OF L-AMINO ACIDS--A process to produce L-amino acids was developed in the context of the Federal Government's Biotechnology Program, as reported by Minister for Research von Buelow. Using a new concept, whose essential factor is an enzyme-membrane reactor, the biologically active L-form of amino acids can be obtained. To date, L-amino acids are mainly produced with suitable microorganisms. The special feature of the process is that a mixture of L- and D-amino acids is chemically produced and then enzymes (biocatalysts) are used which can recognize quite specifically only the biologically interesting form of the amino acids, namely the L-form; thus separation from the inactive D-form becomes possible. In this, the enzymes are used in a soluble form. A membrane keeps the enzymes in the reactor while the amino acid obtained can pass through the membrane and be separated out. In contrast to today's usual production process, the new process is expected to provide substantial improvement in the economic efficiency of the production of amino acids. Worldwide every year about 400,000 tons of L-amino acids are produced. They are required in the medical sector for infusion solutions and for special diet foodstuffs. Beyond that, in the animal feed sector there is a great need, since feed grain, for example, does not show the optimal composition of amino acides for each kind of animal. [Text] [Duesseldorf VDI NACHRICHTEN in German 12 Feb 82 p 4] 12124

CSO: 3102/198

CHEMICALS

SMALL-FIELD OIL EXTRACTION TECHNIQUE TESTED

Bern TECHNISCHE RUNDSCHAU in German 16 Feb 82 p 21

[Article by Michael Gunton: "New Development in Offshore Technology: Test Operation in the 'Beatrice' Small Oil Field"]

[Text] Sooner or later the large oil fields in the North Sea will be depleted. In order to be prepared for this occurrence, work is underway today on utilizing small oil fields, too. In the British Beatrice test field the first experiences in this connection have been gathered.

The start to test production in the British National Oil Company's (BNOC) Beatrice field in Moray Firth off the northeast coast of Scotland marks the highpoint of the work in an oil field that is unique in the North Sea. In contrast to the other fields where pumping is going on or where development is underway, Beatrice is located in relatively shallow water only 45 m deep and is closest to the coast at a distance of only 20 km. The kind of oil alone makes Beatrice different from other North Sea oil fields. The oil has a large wax content, is highly viscous and must be specially treated in order to be able to flow. The location of the field near the coast also causes special monitoring problems in respect to environmental pollution.

The Beatrice oil field was discovered in 1976 in an area which until then had been ignored by the oil industry although the existence of a natural oil outcrop on the bottom of the firth had long since been established. The first successful bore was soon followed by others and in 1977 the field was classified as commercially exploitable with reserves estimated at 160 million barrels. This estimate was subsequently revised to 450 million barrels.

In 1978 the development work started which included the construction of three offshore platforms, the use of a lifting rig and the laying of a pipeline to a new coastal terminal in Nigg. When full pumping capacity is reached the field will deliver 100,000 barrels a day.

High Wax Content: Both Advantage and Disadvantage

Although the specific weight of Beatrice oil is similar to that of other kinds of crude oil in the North Sea, it has a special characteristic which makes

it difficult to handle: a very high wax content of 17 percent. In order to neutralize this property an inhibitor (Pour Point Depressant) must be injected into the drill holes; it must first be heated, something unique in the development of North Sea oil fields, in order to lower to an even greater degree the viscosity of the oil. Also the oil reserves of the field are under relatively small pressure and thus have an abnormally low gas content. This means that pumps had to be installed deep in the drill holes in order to get the oil to the surface.

The oil that is pumped is first piped to the production platform where gas, water and solid matter are extracted to a large degree. The gas serves as an energy source for the platform equipment and for the pumps installed in the drill holes, while the water is purified and pumped back into the sea. From the platform the oil passes through an 80-km long pipeline to the terminal in Nigg where it is warmed and further treated in order to extract any remaining volatile gases, water and solid matter. Then it is stored in two large isolated tanks until it is transported by tankers.

Special protective measures had to be taken for the area around the oil field since the Moray Firth has an attractive coast with a large variety of fauna and rich fishing grounds. Although the high wax content of the oil makes pumping difficult, it proves to be an advantage in combatting pollution. In the relatively cold water of the firth the oil tends to coagulate and under normal conditions can be collected without problem with nets by stand-by ships. In order to avoid spilling oil while loading the tankers, a permanent derrick system was installed. The personnel entrusted with pollution control works with the new "spring-sweep" system of the national Warren Spring Laboratory with which the oil can be drawn off the surface of water or mud using gigantic vacuum pumps.

The Beatrice field oil, which was developed at a cost of 550 million pounds sterling, will not only contribute to Great Britain's oil supply, but moreover, will provide industry with useful experiences as precursors of a type of smaller fields which must be developed in the future in order to maintain oil production at a time when pumping in the large fields will gradually diminish.

12124
CSO: 3102/198

ELECTRONICS

CII HONEYWELL BULL R&D IN MICROPACKAGING TECHNIQUES

Cologne ONLINE in German Jan/Feb 82 p 72

[Article: "Honeywell Bull: Chip Coupling a la francais"]

> [Text] Three hours by car southwest of Paris on N23 Paris—Le Mans lies Angers, a French city of 300,000. Typical scenery for this region consists of the castles and citadels along the Loire which bring back memories of the stirring, royal past. In just this atmosphere settled CII Honeywell Bull from Paris in 1962 and established with 4 production buildings a center of French computer production.

Along with basic research, system recycling and production control, micropackaging has been a prime focus since 1978. This special chip packaging known as SP 32 Technology is supposed to result in a more reliable connection between substrates and chips. The technical challenge of integrated circuits lies in the stacking of functions on the extremely small chip surfaces; and the denser the packing, the more difficult the connection to the outside world. For CII Honeywell Bull, micropackaging is the answer to this "wiry problem."

Piggyback Solves the Space Problem

The first step and another French patent is chip mounting after sawing the wafer, the platform which carries microprocessors, memories, etc. The integrated circuits are built up in waffle fashion on the round silicon plates. A diamond saw separates the individual chips which at this point still have no external circuit connectors. The silicon tablets are inserted into a square hole punched in a strip of ordinary 35 mm photographic film. Copper foil and the light-sensitive photographic emulsion make the film an intermediary for connecting the chip with the outside world.

All of the required electrical connections radiating out from the film hole are photographically exposed through a suitable mask. This ensures that the chip contacts mate up with the conductor strips on the film; finally, the two are connected by a bean of solder. Angers named this process "Tape Automated Bonding." With the chip removed from the film roll, CII HB can load several silos with different chip models. These filling stations dispense their contents for mounting on the substrates.

This conducter plate, or substrate, is a multilayered ceramic square with a network of externally-attachable gold conductors running on and through the material. This ceramic plate also carries the functional chip. On the top side of the substrate, 15 cooling fins are affixed for improved heat rejection.

The advantage of this piggyback construction is a large number of tabs (184) which connect to ordinary circuit boards. In contrast, an LSI microprocessor chip presents a maximum of 40 connectors.

CII Honeywell Bull has successfully employed this process for 3 years and is convinced that it also provides improved system reliability. It is hoped that nationalization--if it comes--will not dampen this computer manufacturer's innovative capability.

9160
CSO: 3102/192

PLANT TO CONVERT ANTHRACITE TO SYNTHETIC NATURAL GAS

Duesseldorf VDI NACHRICHTEN in German 12 Feb 82 p 1

[Text] For the present synthetic natural gas from German anthracite will not be in a position to play a significant role in the public gas supply, but the technical possibilties and processes must still be researched in a timely manner. Thyssengas, Ltd, Duisburg (50 percent of its capital is in state - owned VIAG [United Industrial Enterprises, Inc] and 25 percent each in Exxon, New York, and Shell, The Hague), and Didier Engineering Ltd, Essen, on 29 January 1982 presented to about 120 experts from economics and politics their pilot plant which was built on the grounds of Ruhrchemie Oberhausen; 60 percent of the DM50 million construction costs were borne by the Ministry for Research and Technology.

Since 1977 the technical possibility of realizing the Comflux process, which was developed by Thyssengas and Didier, has been undergoing testing in a semi-technical stage. In the new pilot plant this process for methanation of coal gas is to be improved; moreover, the partners anticipate important findings for the construction of an industrial scale demonstration plant. The goal is to convert in a fluid bed reactor coal gases containing carbon monoxide with a low fuel value into methane which can then be utilized without any problem in the public gas supply.

Project director Dr Werner Lommerzheim explained that the production of synthetic natural gas (SNG) is done in two operations. First, the anthracite is converted to coal gas by using oxygen and steam. However, this gas consists mainly of carbon monoxide and hydrogen and because of its too low fuel value and the too high ignition velocity it cannot be used for the public gas supply. Thus, coal gas is converted to SNG whereby that process favored by Thyssengas, in contrast to the conventional process, accomplishes the methanation in a single reactor. This becomes possible because of the specifics of the Comflux process.

The catalyst used causes both reactions, namely methanation and conversion of the goal gas; moreover, the reaction takes place in a fluid bed reactor and not in a fixed bed reactor. The fluid bed reactor permits especially high heat removal with an isothermic (constant) procedure. The technical reactions consist in the fact that in the process of methanation carbon monoxide and

hydrogen combine to form methane (CH_4) and water and in the conversion a part of the existing carbon monoxide with water forms additional hydrogen and carbon dioxide.

In the fluid bed reactor the coal gases set the powdery ca'alyst into a whirling motion. Hot grains cool down in the process by mixing with colder particles and by means of integrated heat exchangers. In this way superheating is avoided because large quantities of heat are released by methanation and conversion. This reaction heat can, according to Lommerzheim, be converted almost without loss into high quality process steam which can be utilized in a number of ways. In Oberhausen the neighboring coal gasification plant is available for this, which, using the fixed bed process, produces coal gas as a chemical raw material for Ruhrchemie.

12124
CSO: 3102/199

MINISTER OF INDUSTRY INTERVIEWED ON MACHINE TOOL PROGRAM

Paris L'USINE NOUVELLE in French 3 Dec 81 pp 66-68

[Interview with Pierre Dreyfus, French minister of industry, by Georges Le Gall, Rene Le Moal and Alain Pauche: "The Machine Tool Program Under Way"; place and date of interview not given]

[Text] The skeptics will say: "Still another plan for the machine tool industry!" It is true that since 1945 the plans have been as numerous as they have been unfruitful. And the one of 1975 ended in a complete fiasco: It projected for 1980 a minimum production of 130,000 tons; actual production was 69,000 tons! But this time the government appears determined to put in place the necessary means for attaining its ambitious objective. Be that as it may, the French machine tool industry, which 1 year ago, through its union, was demanding a massive intervention by the public authorities, will have its future at stake over the next few years. It will either come of age and take a significant place in the world market, or it will be relegated to the role of a supernumerary. In an interview with L'USINE NOUVELLE, Pierre Dreyfus, minister of industry, explained how he plans to win.

[Question] The machine tool developmental program, announced by the president of the Republic in June, is now ready and should get under way after its examination by the Council of Ministers. Why has the government made of this sector a high-prioritied industrial objective?

[Answer] For a very simple reason: The machine tool program interests not only that industry's 20,000 workers; it directly concerns the future of the 3,500,000 persons employed in industrial manufacturing as a whole, in that the latter cannot be competitive if it uses ancient machines. Our machine tool inventory is in the process of aging from the maintainability and the technological standpoints. The fact is, we have 10,000 numerical-controlled [N/C] machines, whereas the FRG has 30,000, Japan has 50,000 and the United States has 70,000.

[Question] What are the primary objectives of the program?

[Answer] The plan is based on taking advantage of the technological revolution that has been wrought by microelectronics, which has made of the machine tool a

high-technology industry. On the basis of the projected boom in N/C machine tools as catalogued items, sales of which for domestic use in France and for export should increase by 40 percent per year, our objective is to double our total French production of machine tools between now and 1985. This means, in the first place, a reconquest of our domestic market--a decline in foreign machines from 60 percent to 30 percent of our inventory--and, in the second place, a development of our exports, especially to industrialized countries.

[Question] Are these objectives realistic?

[Answer] I cannot deny that they are ambitious, since international competition in this field is very lively. But they are not beyond our reach. Success will depend upon the mobilization of all the partners: government, builders, clients, technical centers, etc. After all, the Japanese predominance in N/C machines had its genesis in a concerted action among the industrialists there and their government, concretized in a law supporting their machine-tool and data-processing industries, passed in 1978 after a period of serious crisis and heavy losses suffered by the principal Japanese builders.

[Question] What period will this program cover?

[Answer] The objective is the bringing into being over the medium term--within 3-5 years--of a competitive French industry in the domain of high-technology machine tools. The initial program covers 3 years; it will be revised in accordance with the results obtained and the evolution of the situation.

[Question] What funding will be provided by the government?

[Answer] Most of the necessary funding will come from normal sources: shareholders and financial institutions. But, given the importance the government places on this program, it will certainly allocate sufficient public credits to provide it with significant leverage.

[Question] There can be no serious growth in production if the domestic market continues anemic. Its volume declined by 30 percent between 1973 and 1980, and orders during 1981 have declined even more. How do you plan to reverse this downtrend?

[Answer] Our objective is specifically to place 16,000 new numerical-controlled machines in service between now and 1985. Selective measures in support of domestic demand will be put in place, including, in particular, expansion of the MECA [Advanced Design Machines and Equipment] procedure (for the acquisition of machines and equipment of advanced design) and robotics loans. An active policy of public sector orders (from the Ministry of Education, the Adult Occupational Training Agency, the arsenals) will be implemented with a dual objective: To facilitate reconversion of the machine tool sector through the launching of high-technology machines, and train the future workers in that industry on modern equipment.

In addition, the broader public sector is going to invest heavily, put its shoulder to the wheel and operate to attract private investment. Lastly, the ADEPA [Agency for the Development of Automated Production] is going to intensify its efforts in support of the PMI [Small and Medium Industries] by beefing up its regional setup.

In sum, the plan is to abandon the current vicious circle--in which the French machine tool industry does not put out enough sufficient modern equipment, and the clients distrust this industry--and go into an upward spiral by simultaneously stimulating the supply and demand for modern machines.

[Question] Does the plan also provide for aid to exports?

[Answer] It does indeed provide for measures to stimulate sales to foreign countries. These are included in the current discussions on assistance to foreign trade.

[Question] In July, you indicated there is a need to "adapt structures." How will this be done?

[Answer] As you well know, I am not obsessed by size. In certain specialties, the PMI's can very well grow, on the domestic market as well as in the export sector. It is just as true, however, that some regroupings are necessary. But it is not only the production tooling structure that needs improvement. Research and the training of workers require attention. I would like to see the research and development effort, which is to be augmented, divided between collective and individual research among the enterprises.

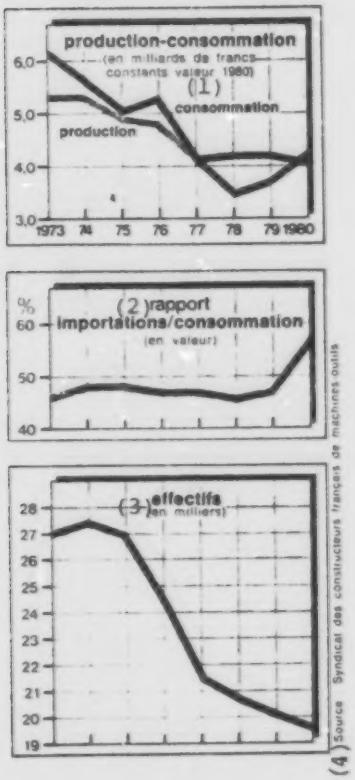
Three technological poles will be set up around which the national technological effort will gravitate: The CERMO [Machine Tool Research Center] and the ENSAM [Ecole Nationale Superieure des Arts et Metiers]; the ADEPA; and the CETIM [Mechanical Industries Technical Center]. Each of these poles will have a specific orientation and will coordinate the operations of various scientific bodies. The staffs entrusted with the management of these three poles will be strengthened by persons coming from major using industries, such as the automobile, aeronautics and armaments industries.

And this combined technological innovation effort will be enhanced by a program for the training of engineers and of highly specialized technicians in automation and production techniques.

[Question] But will the structure of our machine tool industry be changed?

[Answer] Yes. And the restructuring will concern components as well as complete machines. Taking as an example what is occurring in Japan, French builders must be able to procure components at competitive prices, since these represent a

Halting the Decline



Key:

1. Production and consumption (in billion francs at constant 1980 value).
2. Ratio of imports to consumption (in terms of value).
3. Permanent employees (in thousands).
4. Source: Association of French Machine-Tool Makers.

The objective of the machine-tool program is to halt the decline of French industry in this sector, which has dropped to eighth place worldwide, just ahead of East Germany and...Romania, China, Poland, etc. An end must be put to our chronic weaknesses: Production lower than our consumption; a very high rate of imports to satisfy domestic demand; a foreign trade deficit (In 1980, overall coverage of imports by exports totaled 93 percent, but not over 29 percent with the FRG and Italy, which alone represent half our purchases abroad).

growing percentage of the cost of machines. The outlook for increasing our production of N/C machines--we are projecting 5,000 units in 1984--justifies a national effort in support of the creation and development of a powerful industrial sector for the fabrication of components intended for machine tools and robots.

To be competitive with foreign producers requires moreover a certain minimum production capacity by types of machines. The planned regroupings will provide the opportunity for the rebuilding of highly competent management teams and design departments of adequate magnitude. These regroupings will involve substantial investments from the marketing as well as the production standpoints, including, in particular, the introduction of flexible workshops.

[Question] Do you think the industrialists are prepared to go along with these regroupments?

[Answer] I believe they are. As you well know, the program was not drawn up behind closed doors by government officials. Between August and October, more than 200 persons, representing enterprises, clients, suppliers and managements, took part in drawing it up. During these meetings, the need for a reorganization of French industry was brought out, and this view is shared by industry managements.

Contracts will now be negotiated between the government and enterprises. They will be based on specialization of product lines, standardization of components, the training and employment of highly qualified personnel, and an incremental growth in their French domestic and export sales turnover. The problem of the extent to which investments will be covered by public funding will obviously have to be dealt with during the negotiations. And I wish to emphasize that these developmental contracts can be signed with enterprises that have decided to remain isolated as well as with those that may have chosen to merge.

[Question] Beyond machine tools, what will be your policy as regards the machine industry in general?

[Answer] Concurrently with the machine tool program, and by way of the same process, I plan to undertake a robotics program. Generally speaking, the objective is to endow France with a powerful and competitive capital goods industry. In fact, with the decision to institute measures to help the textile industry I also announced that a developmental program for textile machines would be drawn up.

9238
CSO: 3102/159

FRENCH GOVERNMENT ACTS TO SAVE MACHINE TOOL INDUSTRY

Bern TECHNISCHE RUNDSCHAU in German 16 Feb 82 p 34

[Article by Helmut Altner: "Tax Payers Will Revitalize Selected Branches of French Industry"]

[Text] Several branches of French industry have suffered serious setbacks at home and have registered little progress in export markets. In recent months these industries have intensified their efforts to convince the new socialist-communist government that only restructuring programs with high government subsidy will be able to force down the foreign share--often over 50 percent--of the domestic market and help French industry wrest a greater share of the export market from foreign competitors. They are banking on the government's expressed objective to reduce by half the import of certain industrial and consumer goods and to increase exports by a significant percentage.

The Government Will Pay for Private Neglect

Among the branches in dire need of government subsidies running into the billions are machine design and general machines as well as machine tools and textile machines. Foreign competition is especially strong in these sectors in both the domestic and export markets. This machinery gap is partly technological and is the result of several years of neglect.

The government's first rescue plan was developed for the machine tool industry. Minister of Industry Pierre Dreyfus presented a program in December which provides for doubling machine tool production, reducing imports by half and increasing exports over the next 3 years. F 4 billion will be spent to achieve this goal. The government will provide F 2.3 billion as direct aid while the remainder must be raised through loans. This "Machine Tool Plan" is supposed to end the industry's 7-year crisis and make it competitive again. Similar earlier plans, such as the government's 1976 program for support of the machine tool industry, failed. The result was practically nil in spite of large government subsidies.

The number employed in the machine tool branch decreased between 1975 and 1980 from 27,000 to 19,000. Several companies in this highly fragmented branch had to close their doors. With sales of F 4.1 billion and exports of F 2.18 billion, France, as a machine tool producing nation, has fallen behind not only the United States and the FRG but also Italy and Switzerland, winding up in eighth place in

1980. And by 1982 France will possibly have to be satisfied with ninth place behind the GDR.

Small and Medium-Sized Firms Stagnate

France's greatest lag in the face of foreign competition is in the latest NC machine tools. Today the French machine tool inventory is obsolescent and only 10,000 NC machine tools are in use compared to about 70,000 in the United States, 50,000 in Japan and 30,000 in the FRG. Also, a significant portion of these modern machines are imports. In spite of the government's highly subsidized "Numerically Controlled Machine Tools" plans, this branch has been unable to make the decision to commit large sums for the development of such machines. For the most part this is due to the fact that the more than 150 companies of the branch belong mostly to the PME sector, that is are small and medium-sized firms without adequate financial means. The strong foreign competition has caused many firms to fold. This holds, however, not just for the PME firms but also for many well-known large companies. For instance, GPS, Line and Ratier-Forest, which were among the largest manufacturers, have gone bankrupt. Several other large companies like Ernault-Souma are mired in serious economic difficulties. With the new rescue plan involving funds amounting to a year's income for the entire branch, the government will have a strong voice in restructuring. Most of the F 4.0 billion will be awarded as direct subsidies; the remainder will be made available as low-interest loans.

9160
CSO: 3102/200

ADVANCED SURFACE-TREATMENT TECHNOLOGIES IN USE IN FRANCE

Paris L'USINE NOUVELLE in French 21 Jan 82 pp 72-73

[Article by Edmond Degrange: "Thermal Methods of Surface Treatment Gaining"]

[Text] "More and more, conventional methods of heat treatment throughout, which are guzzlers of energy, are being replaced by localized methods of treatment," Mr Naylor, of the CETIM [Mechanical Industries Technical Center], pointed out at the recent meeting of the CETIM-ATTT [Heat Treatment Technical Association]. What is more, the well-known surface-treatment methods, such as cementation, nitriding and carbonitriding, are being added to by localized methods using electronic bombardment, lasers and ion deposition. "But," says Mr Basile, of the ENSAM [Ecole Nationale Superieure des Arts et Metiers], referring particularly to electronic bombardment, "this treatment is not a substitute for the conventional methods such as cementation or induction. It supplements them."

Its specific power is very high: Energy densities of the order of 10^6 to 10^8 W/cm^2 can be obtained; that is, 100 to 10,000 times greater densities than are possible with conventional methods of treatment such as induction or plasma. The temperature rise is very rapid and total heating is reduced. The result is very limited deformations.

Other noteworthy advantages are: Energy efficiency over 85 percent and the possibility of control over the heating cycle by means of a microprocessor, enabling in particular the surface to be swept impulsively instead of continuously.

The risks of local fusion in complex pieces are reduced, since the trajectories of the beam need not overlap. The depth of treatment can also be varied by programing the energy densities to be applied at each point. The thicknesses treated are of the order of 0.1-2.5 mm (1,500 cm^2/min at a depth of 0.75 mm, and 800 cm^2/min at a depth of 1.5 mm). They must be less than 1/4 the thickness of the piece. In the case of treatment of an interior surface, the bore must have a diameter of at least 50 mm. The hardnesses obtained are 2 to 3 points higher than those obtained with conventional treatments.

The performance of the laser-beam method is comparable to that of the electron beam, with the added advantage over the latter that it operates in an atmospheric environment instead of in a vacuum. Generally speaking, the laser used is of the

CO_2 type with a power of up to 5 kW and a beam diameter of the order of 20 mm, the sweep being obtained by mechanically or electromechanically (oscillating mirrors or segmented mirrors) controlled oscillation of the beam. One particular applicational niche: Selective treatment of geometrically complex pieces (gear teeth) and zones not easily accessed (tube interiors) with minimum distortion.

The need to coat the surface to be treated with an absorbent substance to avoid reflection of the beam presents no problem, since the coating is immediately vaporized without any resultant pollution of the surface.

Mr Decaux, of the Optilas Company, stressed another interesting feature of laser-beam treatment: Because of the power density obtained, surface alloys can be produced. This technique consists of locally depositing a very-high-resistance material over a softer surface. The problem currently under study is that of the bonding between the applied material (in powdered form) and the substrate. This an extremely promising field of application. Other types of treatment are presently being studied; for example, the surface fusion of electrolytically deposited layers of nickel and chromium, on steel, to produce a stainless steel coating.

For claddings resistant to corrosion and wear, such as chromium or titanium carbides and nitrides, the ion deposition method also appears promising. These claddings have until now been obtained by chemical methods at high temperatures of the order of 1,000 degrees C. Ionic methods of treatment require much lower temperatures, generally less than 500 degrees C, and introduce no pollution problems. According to Professor Gantois (head of the Metallurgical Engineering Laboratory at the National Polytechnic Institute of Lorraine), for example, the ionic deposition method can be used to obtain a cladding of TiN at around 550 degrees C, on high-speed cutting steel, without altering the basic characteristics obtained by means of a prior heat treatment. Such a cladding increases considerably the useful life of cutting tools.

There is bound to be considerable development in the field of application of these depositional methods, but much work remains to improve their productivity and reproducibility of results. This aspect of standardization and control of quality has led to the development of nitrogen-based atmospheres, such as binary compounds of nitrogen and hydrogen and of nitrogen and hydrocarbons, which are simple and reliable. These atmospheres guarantee the absence of oxidation and decarburization of carbon steels, while preserving the safety aspect of nitrogen.

For controlled carbon-potential treatments (tempering, carburizing, carbonitriding), nitrogen-methanol compounds make it possible to restore all the conventional types of atmospheres used heretofore. This technique is used in the Alnat-C method developed by Air Liquide. Mr Kostelitz says in this regard, "Modulation of the nitrogen-methanol ratio enables the tempering of low-carbon steel. It also makes cementations possible with an augmented transfer of carbon to the surface. The technique of suspending carburization during weekends or work stoppages makes for increases in productivity the magnitude of which is the greater for cycles of longer duration. Furthermore, nitrogen-base atmospheres lend themselves well to automation and data processing of methods.

Cementation: An Automated Oven Control System

Another automation breakthrough, this time in the case of cementation: On the basis of a probe that determines the carbon content in the atmosphere of a gaseous cementation oven, the Logista Company has developed an automated oven control system. The measurements taken inside the oven on a continuous basis are processed and analyzed by a microprocessor. This makes it possible, Mr Pelegrin explains, to display on a screen and to edit on a printer a large number of parameters, such as the temperature, the carbon content of the oven's atmosphere, the duration of the cycle, and the influence of the alloy elements contained in the steel.

In its current version, this machine can control some 20 sequential treatment cycles without any human intervention. Currently under study is the possibility of regulating the temperature and the intake of support gas on the basis of information transmitted by the probe and processed by the microprocessor. Use of the system is especially easy; operator learning time need not be more than 2 or 3 days.

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CSO: 3102/159

NEW APPLICATION FOR ELECTRICAL DISCHARGE WELDING

Paris L'USINE NOUVELLE in French 3 Dec 81 pp 124-125

[Article by Jean Nenin: "Little-Known Applications of Electrical Discharge Machining"]

[Text] The Luziesa Company uses electrical discharge machining [EDM] to form cavities of all shapes, not otherwise "strippable," without affecting the metallurgical qualities of the metal.

It also uses this technique to produce artificial flaws for the purpose of calibrating nondestructive-testing instruments.

An Italian builder of high-powered marine engines (50,000-100,000 hp) was trying to devise a hollow exhaust valve that could be cooled by forced circulation of oil through a coaxial tube. The rim temperature can actually reach 900 degrees C, and the failure of a single valve, which can immobilize a vessel, represents a substantial loss.

A series of attempts to strip the inside of the valve body by electrochemical machining [ECM] gave unsatisfactory results. It was then decided to fabricate these valves by welding a lid over a flared stem that had previously been hollowed out by turning on a lathe. The welds, however, proved unsatisfactory using conventional methods, and the builder called upon the European research center ISPRA [expansion unknown], which is very well equipped for electron-beam welding. Again, the results proved unsatisfactory, given the severe operating conditions to which these valves must be subjected.

Any Point Can Be Reached From a 10-mm Diameter Hole

It was then that two ISPRA researchers thought of hollowing out the valves by the EDM method, using a remotely controlled orientable electrode. The first prototype, although rudimentary by comparison to the present more sophisticated and automated tool, was completed in 8 months, and a first run of 50 valves was fabricated. They operated successfully.

The method was patented and the EC Commission granted using rights in Italy, in Germany and to the Luziesa Company in France.

From a reading of the texts of the patents, the system of control (purely mechanical) of the electrode movements appears quite complex. It enables any point to be reached inside the body of a solid piece (within a radius of 50 mm, for example), from a hole 10 mm in diameter and 1 meter in length. This electrode can thus form cavities of all shapes, revolutional or not, flat-, convex- or concave-bottomed. This requires an assembly of mechanical components such as will permit the necessary combination of different movements to be effected in a restricted space: On the one hand, rotation of the electrode about an axis perpendicular to the axis of the initial bore (or of penetration), and on the other hand, a movement of translation of the electrode to determine the profile of the wall of the cavity.

During these various movements, the piece can remain stationary (to obtain a flat cavity) or be rotated (for a revolutional cavity), or a combination of these.

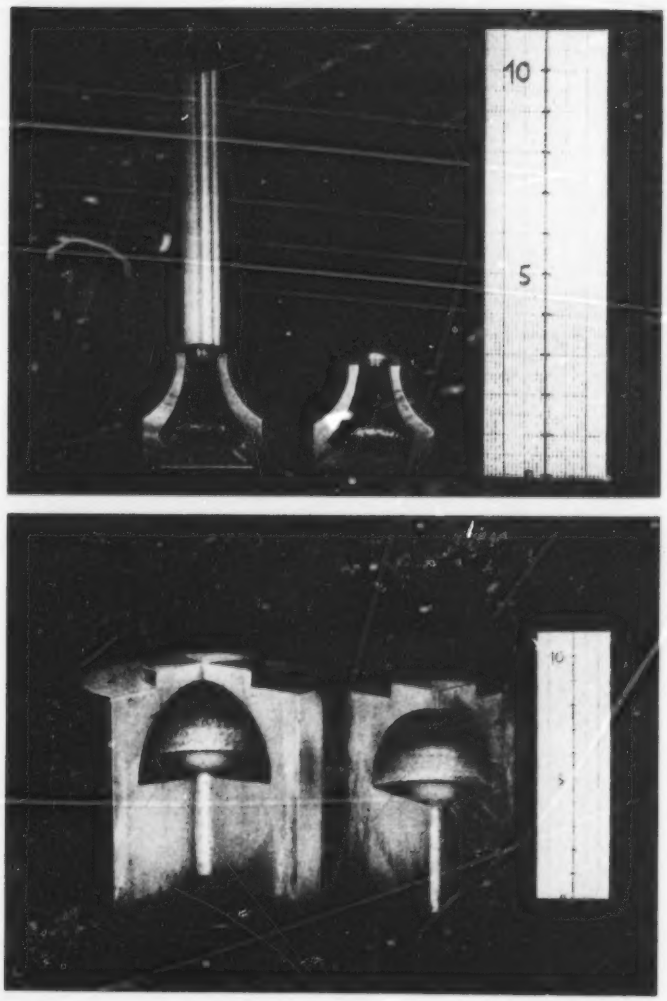
Equipment That Lends Itself to Miniaturization

The actual electroerosion takes place along a generatrix of the electrode, and the final profile of the cavity depends upon the geometrical form of this electrode. As regards desired surface smoothness, it can be obtained by proceeding from roughing to polishing. However, if the purpose of the cavity is to provide for cooling (as in the case of the valves), a relatively rough surface texture enhances the heat-exchange process by creating microturbulences.

This equipment is not limited to marine engine valves (16-mm bore). It lends itself to miniaturization and can be used for smaller valves (aircraft engines or Diesel engines). Tests are being conducted in the domain of turbine vanes, where mechanical strength and cooling are two imperatives. Other applications are being considered (high-pressure chambers subjected to pressures of 1,000-2,000 atmospheres).

The basic advantage of this method lies in its potential for hollowing otherwise unstrippable cavities under conditions that cannot be met by any other known method; that is, while preserving integrally the prior metallurgical characteristics of the metal or alloy that were present at the start of the operation. By contrast, if these cavities are obtained by casting (lost-mold or any other method), these characteristics will depend upon the conditions under which the casting is made; if the cavities are obtained by welding, the problem posed is that of the strength of the bond and of the actual continuity of the weld in the case of particular geometric configurations.

The Luziesa Company has also specialized in an activity that is probably unique in the private sector: The creation, in sound pieces, of artificial flaws for the purpose of calibrating nondestructive-testing instruments. These artificial flaws consist of small cracks, fissures, etc, produced at the request of the user at points in the piece where the same flaw may be expected to occur under actual operating conditions. For example, flaws 2.5 mm long, 0.05 mm wide and deep in stainless steel tubes, in the threading and barrel of studs and nuts for nuclear reactor vessels, as well as flaws in the hoops of alternators 1.75 m in diameter



These two prototype pieces, made by ISPRA researchers, were hollowed out by the EDM method, using a remotely controlled orientable electrode.

and weighing 750-1,000 kg, have also been created. These artificial flaws are of mechanical nature or related to corrosion phenomena. In the latter case, the corroded surface condition is also reproduced by the EDM method.

This type of flaw could easily be obtained by an accelerated corrosion process, but the method developed by Luziesa has the advantage of avoiding unwanted perpetuation of the corrosion process and of being perfectly reproducible.

Artificial flaws can be created on the client's own premises in the case of large pieces that are difficult to transport. A control report including a replica of the flaw, its dimensions and a sectional photograph of it is always furnished to the client at the same time. "We also do machining and and create artificial flaws by ultrasonic methods," says Mr Demoulin, "but the random character of the abrasive in suspension makes precision of the order of 0.01 mm particularly hard to obtain. In these cases, and provided the nature of the material permits, it is better to turn toward EDM."

9238
CSO: 3102/159

BRIEFS

NC MACHINES IN SWEDEN--More than 6,000 numerically controlled (NC) machines will be employed in Sweden by 1985. This was announced at a seminar jointly sponsored by the Swedish Metal Industrialists Employers Association and the Association of the Swedish Iron and Metal Working Industry. The number of NC machines employed in Sweden increased more than sevenfold during the 1970's, going from 500 units in 1970 to 3,600 units in 1979. The first industrial robots in Sweden were installed in the late 1960's, and by 1970 about 50 were in use. With an annual growth rate of 40 percent throughout the 1970's, the number reached 950 by 1979. An annual growth rate of 25 percent is projected for the 1980's which will bring the number of robots in service to 3,000 by 1985. The Swedish machine-tool industry is regarded as one of the most advanced in the world. In the Swedish manufacturing industry, more industrial robots and NC machines are used per employee than in any other country. As one of the world's leading robot exporters, Sweden is the third largest manufacturer of industrial robots behind Japan and the United States. [Text] [Duesseldorf VDI NACHRICHTEN in German 5 Feb 82 p 34] 9160

OLIVETTI 'SIGMA' ROBOTS--Olivetti and the American electrical manufacturing firm Westinghouse will collaborate in the area of industrial automation. An agreement to this end was recently signed by Westinghouse and OSAI (Olivetti Sistemi per L'Automazione Industriale), a member of the Olivetti group. The 5-year contract provides initially for the acquisition of 40 Olivetti Sigma robots by Westinghouse. In addition, Westinghouse will have the exclusive license for producing, distributing and servicing Sigma robots in North America. Sigma is a high-performance assembly robot whose arm moves about nine independent axes. The arm and the special sensors were specially designed for precision assembly work. In Europe Sigma is the most widely proliferated robot for use in precision mechanics, electromechanics and electronics. [Text] [Leinfelden-Echterdingen DIE COMPUTER ZEITUNG in German 3 Feb 82 p 2] 9160

CSO: 3102/192

DATA PROCESSING AGENCY REVIEWS SECOND YEAR'S ACCOMPLISHMENTS

Paris ZERO UN INFORMATIQUE HEBDO in French 22 Feb 82 p 5

[Article by Evelyne de Lestrac: "ADI's Second Year Assessment. Research, Training, Information"]

[Text] As it celebrated its second anniversary (see 01 HEBDO No 684) on 15 February, the Data-Processing Agency, now under the control of the Ministry of Research and Technology, could make a "positive" assessment of its activities and presented its new budget for 1982, amounting to a total of approximately 400 million francs, a 30 percent increase over last year.

On this occasion, Bernard Lorimy mentioned the three main lines which correspond to approximately equal proportions of the agency's activities: first, aid to research and pilot projects. Notice that 124 research contracts (approximately one third of all applications) were signed in areas considered to "have priority": CAD, automation and robotics, video and data-processing applications, CAI and software engineering. Other activities are being contemplated, especially the use of natural language and computer-assisted translation.

According to the agency's president, pilot projects "are the most effective means of enchancing communications between research and industry"; he mentioned the six projects now in progress, the two most recent ones being Nadir (1980) for the use of satellites in data-processing, and Rhin (March 1981) for the heterogenous networking of data-processing systems.

The second line deals with training; in this respect, the agency emphasizes the fact that it has contributed to train 1300 data-processing specialists and that it "will continue to work in this direction." The use of computers in education is one of the agency's objectives; it will be realized in the near future through the implementation of a "microelectronics program." This program, carried out in collaboration with the Ministry of National Education, aims at integrating microelectronics into education in some 30 IUT's [University Institutes of Technology] (see 01 HEBDO No 684).

Finally, "central theme from which the agency gains its experience," information on applications represents the third main line. Since its creation, ADI has multiplied its contacts with all professional categories (over 600 different professions to-date); last year it has signed 671 agreements, compared with 439 in 1980, i.e. an increase of almost 54 percent in one year.

Support Activities

This year, the agency plans to diversify and expand its activities through support functions, especially by intensifying its regional activities through "contacts between the agency and all local authorities" and the installation (upon request) of about a dozen regional organizers of data processing activities (AIR) during 1982. In addition, it plans to amplify its international "technoligical watch" potential by opening an office in Japan (after that in Sunnyvale, California) in the near future; it will also play a part in the creation of the World Micro-computing and Human Resources Center. It will also implement a "software packages program" which will associate designers and users, because "software must become industrialized in order to maximize the efficiency of our 'grey matter' potential," the president of ADI stresses.

Finally, economic and legal studies on the problems which arise in connection with the development of data processing are in progress. Some of the subjects treated: "System of Economic and Statistical Information on the Dissemination of Information on Data Processing Applications," "Data Processing and Work," "Economic Information and Data Banks."

9294
CSO: 3102/188

FRANCE, FRG: NEW AREAS OF SCIENTIFIC, TECHNICAL COOPERATION

Paris ELECTRONIQUE ACTUALITES in French 5 Mar 82 p 3

[Article: "France-FRG: Toward New Areas of Scientific and Technical Cooperation"]

[Text] France and the FRG are planning to intensify their scientific and technical cooperation, especially by extending it to new areas.

This is the outcome of the conversations which the ministers of Research and Technology of the two countries, Messrs Andreas von Bulow and Jean-Pierre Chevenement, had at the Franco-German summit meeting.

According to the French minister, they have agreed to develop their cooperation "on land, at sea and in space," including, whenever possible, the "European space."

In the field of energy, for instance, the two ministers--who are scheduled to meet in Brussels, on 8 March, with the other EC ministers of research--plan to revive the thermonuclear fusion research program so as to undertake the construction of new research "machines" like Thor Supra, which could be located at the Nuclear Research Center of Cadarache.

The two countries will consider the possibility of joint actions, especially in the field of solar energy to benefit developing countries.

A sizable effort will be undertaken in the area of microcomputing, and the two ministers have also decided to co-chair a meeting devoted to the study of their industrial policy, to be held toward the end of this year at the Ludwigburg Franco-German Institute.

A cooperation is also said to be taking shape in the area of surface transportation; it would combine the successful French TGV (high-speed train) and the German magnetic propulsion system in a future European network.

Generally, the ministers have decided to improve the use of their large scientific facilities by researchers of both countries. French researchers will be invited to the Bessy Institute in Berlin where very fine micro-lithographic techniques are being developed (they are of interest in making electronic components).

The French and the German are both in favor of the construction of a large synchrotron radiation research machine in Strasbourg.

In the field of oceanography, not only will research ships be "lent" to German researchers, but so will the '3,000' diving saucer. Moreover, the two countries are much interested in the construction of a European deep-drilling ship (up to minus 3,000 meters), in the exploitation of metal-containing muds, and in the harvesting of polymetallic nodules.

Generally, in line with the impetus which both countries wish to give to the exploitation of the ocean, German oceanographic laboratories will gain easier access to the French submarine research equipment.

Where space is concerned, France and the FRG (as well as other European countries) have recently decided to proceed with the construction of more powerful satellite launchers (Ariane IV model) and with the improvement of the space laboratory (Spacelab) launched on the American shuttle; they have now taken a number of measures with respect to the management of activities and programs.

In addition, initiatives are planned in the field of joint Franco-German scientific audiovisual productions aimed at the general public, in the field of scientific and technical information, etc.

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CSO:3102/188

BRIEFS

MORE AID FOR TECHNOLOGY--With a special support program Minister for Research von Buelow wants to promote more strongly the establishment of technology-oriented enterprises. In order to cope with the technological and social problems of the 1980's we must succeed in mobilizing the requisite "renewal forces." Young technology companies could make an important contribution in this area. According to the Ministry for Research and Technology an ad hoc committee has been established with the cooperation of banks, middle-level industrial firms and technology consultants. This "mixed"committee has since ascertained that the appropriate potential of ideas and personnel is larger by far than generally assumed, but special efforts are required in order to lower the "entry threshold" for establishing enterprises. [Text] [Leinfelden-Echterdingen DIE COMPUTER ZEITUNG in German 3 Feb 82 p 1] 12124

ELECTRONICS POLICY OUTLINED--At a meeting last Wednesday, the Cabinet appointed the general directors of the recently nationalized companies. On this occasion, the Minister of Industry, Pierre Dreyfus, outlined his industrial policy which, in the fields of electronics and computers, relies on the capabilities of Thomson, CGE [General Electric Company], Matra and CII [expansion unknown]-HB[Honeywell Bull]. The leaders of the recently nationalized companies include two newcomers, Alain Gomez at Thomson-Brandt and Jean-Pierre Brunet at CGE , and two oldtimers, Roger Fauroux at Saint-Gobain and Jean Gandois at Rhone-Poulenc ; to a greater or lesser degree, they will contribute to shape the new policy for the computer industry. As is known, the cases of Matra and CII-HB will be dealt with in a different manner. The President of the Republic and the Minister of Industry have commented on this implementation of the nationalization law; large excerpts of their comments are given in page 20 of this issue of 01 HEBDO. Concerning more particularly the industrial policy of state enterprises, the Minister of Industry restated his objectives: employment, competitiveness through an energetic expansion of investments and research, dynamism on the international market. He defined five fields of action: steel-making, chemicals, materials, health and electronics. "In the latter field," he stated, "the whole product line, from electronic components to robotics, will be the subject of a comprehensive policy relying on the respective capabitilies of Thomson, CGE, Matra and CII-HB." In addition, in a letter to the general directors of the nationalized companies, outlining their mission, the minister emphasized the necessity of achieving, first and foremost, "economic efficiency through a continuous increase in competitiveness." [Text] [Paris ZERO UN INFORMATIQUE HEBDO in French 22 Feb 82 p 1] 9294

CSO: 3102/188

TWO AUTO PROJECTS FOLD, LACK OF FUNDS

Copenhagen BERLINGSKE TIDENDE in Danish 15 Mar 82 p 7

[Article by Finn Knudstrup]

[Text] Efforts to carve out a Danish niche in the field of automobile production are going badly. The factory that produced the recycled Safari car just went under. At the same time, Energy Minister Poul Nielson turned down the request of the Danaford auto firm in Copenhagen for funds with which to develop a car that could run on gas from the North Sea.

The "mill car," or the Safari, as engineer Bent Due called the partially Danish-built car, is no longer being made. The six car production workers at the Mols factory have been given notice. Due was unable to obtain risk capital--he needed 1 million kroner. But neither the banks nor private lenders were willing to lend him the money. Bent Due's bank did not wish to comment on its refusal.

Bent Due himself said it was a bitter blow both for himself and for Denmark that production of the Safari car had to halt. The project which began a year and a half ago got up to only 20 cars. And Bent Due said that he had lost 1 million kroner.

The Safari car was based on renovated parts from Type 1 VW cars covered with a fiberglass shell. The Auto Inspectorate would not approve the model because they could not be sure that each car would be identical with the first approved car--precisely because the basic technology depended on used parts.

Natural Gas Car Turned Down

Danaford, a section of the K. W. Bruun auto concern, also lacks 1 or 2 million kroner needed to make a Danish car idea a reality--a Ford Taunus that runs on gas from the North Sea.

The firm optimistically ordered the parts for the car--in the belief that a car of this kind would be viewed as ideal by Energy Minister Poul Nielson. But the minister turned down the request for research funds, saying that there was not enough propulsion energy in natural gas. The energy minister

is more enthusiastic about diesel-powered cars because he thinks that much of the oil now used for heating will be left over when the natural gas project is completed. It would be more profitable to put this oil into cars than it would be to use gas, Nielson said.

Danaford's idea was based on natural gas users having a compressor that would put household gas under pressure so it could be blown into a car tank. In other words, one could tank up at home in the carport. But it is necessary to put the natural gas under 10 times as much pressure as in normal car [as published] gas--and that makes difficult demands on the technology. It was money for funding research that would solve these problems Danaford asked Poul Nielson for, but in vain.

There are cars powered by natural gas in both Italy and New Zealand.

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CSO: 3102/205

BRIEFS

PLASTICS IN BRITISH CARS--A 3-year development program amounting to 1.4 million pounds sterling has been started by a group of British manufacturers and suppliers with financing by the Ministry for Industry. Wheels, suspension arms and coil springs are to be developed from reinforced plastics. Replacing metals by plastics is viewed as a way of saving weight whereby fuel consumption can be further reduced. The technical program is being carried out in the National Engineering Laboratory in East Kilbride and in the Materials Engineering Centre of Aere Harwell. The consortium consists of the following companies: BL Technology, Ford Motor Co, British Petroleum, Ciba Geigy, Courtaulds, Pilington Brothers, Shell Chemicals, Turner and Newall, Dunlop, Jonas Woodhead, Lucas Industries, Mintex. [Text] [Duesseldorf VDI NACHRICHTEN in German 5 Feb 82 p 9] 12124

SUPER BATTERY--Odense--A cooperative effort that includes the energy research laboratory at Odense University, the mineral industry laboratory at Denmark's Technical College, the Royal Porcelain Factory and Haustrup's Factories in Odense is expected to result in Danish development of a super battery that can hold ten times as much energy as the current lead batteries. People at the energy laboratory in Odense have been working with colleagues in England and elsewhere for several years in an effort to come up with a battery that would hold five times as much energy as the batteries now being used. Now there are indications that trials in this country with ceramic materials could increase the efficiency tenfold. In addition there is every indication that a ceramic battery would be cheaper to use than the types of battery we are familiar with today. The battery is the central element in electric cars. Folketing has just lifted the tax on electric cars so that electric cars could compete with gasoline- and diesel-powered cars in both purchase price and operating costs. In Odense a car was recently demonstrated that is the first in a series of cars running on batteries. This car will be in great demand when and if the tests of the new batteries do well. [Text] [Copenhagen AKTUELT in Danish 5 Apr 82 p 20] 6578

CSO: 3102/205 END

JPRS 80744

6 May 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 102

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JPRS 80744

6 May 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

No. 102

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BRIEFS

EEC BIOMOLECULAR ENGINEERING PROGRAM--Brussels--Adopted last 7 December (decision of the Council, published in the JOURNAL OFFICIEL of the EEC, on December 30, 1981), the EEC research and training program for biomolecular engineering (in the form of indirect action) covering the period of April 1982 to March 1986 will affect the six following topics: 1) development of new reactors using multi-enzyme immobilized systems, including systems which require multiphase environment and cofactor regeneration; 2) development of bioreactors for human detoxification; 3) transfer of genes of various origins to Escherichia coli bacterium, Sacharomyces cerevisiae yeast, and other appropriate organisms; 4) elaboration of cloning methods; 5) transfer of genes to microorganisms and plants with agricultural value; 6) improvement of detection methods for contaminations, and of evaluation of possible risks associated with the application of biomelecular engineering in agriculture and industry. The first phase of the program will begin on 1 April 1982 and end on 31 March 1984 when it is expected that a decision for review will have been reached. [Text] [Paris CHIMIE ACTUALITES in French 29 Jan 82 p 20] 11,023

RECOMMENDATIONS ON GENETIC MANIPULATION--On 26 January, in Strasbourg, the parliamentary assembly of the European Council approved proposed recommendations on genetic manipulation. Presented by Bjoern Elmquist (Danish Liberal) for the legal implications and by Lennart Pettersson (Swedish Social-Democrat) for the scientific and technological ones, these proposed eight-point recommendations provide for "specific acknowledgement" in the European Convention on the Rights of Man, of the "right to a genetic legacy which has undergone no manipulation except in the application of certain principles recognized as fully compatible with respect for the rights of man." Also recommended are the framing of a European agreement on what constitutes legitimate application of genetic engineering technology to human beings; the establishment of a list of severe malignant diseases susceptible to treatment by genetic therapy with the consent of the party involved; the definition of principles regulating the collection, storage, and utilization of genetic data on individuals; and the examination of protection standards for the health and safety of the general public and of laboratory workers. The authors of the project also request the coordination of European measures to guarantee this safety; examination of proposed recommendations from the Council of European Communities concerning records of experiments involving genetic recombinants; and lastly, examination of patentability of genetically modified microorganisms. [Text] [Paris AFP SCIENCES in French 28 Jan 82 p 7] 11,023

FRENCH COMPANY EXCHANGES FRENCH MARKETS FOR U.S. TECHNOLOGY

Paris L'USINE NOUVELLE in French 18 Feb 82 p 66

[Article by Thierry Quinsat: "Sorep: Brittany-Style Silicon Valley"]

[Text] Without complications, Guy Dadou, chairman of the Sorep directorate, went to explore the small and medium-sized enterprises (PME) on the coast of California. In exchange for being introduced to French customers, two American companies will contribute their advanced technology. By 1985, 250 jobs will have been created.

"The American PME may have a little more money than we do, but they do not always have the means to locate an office, engineers, or salesmen in Europe. They are therefore interested in agreements with independent companies, of the same size as themselves, already existing on the European market."

It is with these arguments that Guy Dadou, chairman of the Sorep directorate (Rennes Company for Professional Electronics, 160 employees in Chateaubourg), straightforwardly went to prospect in the Silicon Valley. He found two customers, Apply Micro-Circuit Corporation (AMCC) and Hybrid System, with whom he has created two subsidiaries (51 percent Sorep in both cases).

In exchange for being introduced to French customers, the Americans contribute their very sophisticated technology: AMCC in the fabrication of LSI integrated circuits, and Hybrid System in the manufacture of data conversion circuits.

Between now and 1985, Guy Dadou predicts a ten-fold increase in turnover (22.3 million francs in 1981) and the hiring of 250 people. In his words, the whole thing sounds simple: "You know, the Americans said OK essentially because we were the same size as they are and because we were totally independent. In fact, I am sure that other enterprises would be ready to do the same. All you need to do is to go and see them."

But Guy Dadou is not just anybody. In the 1960's he participated in the fabrication of the first germanium transistors. He next directed a semiconductor plant, subsidiary of an Italian group, in Rennes (450 employees). And in July 1978, together with a few co-workers, he created Sorep to operate in two directions: the fabrication of hybrid circuits, and research in applications for PMI (small and

medium-sized industries). The founders brought one-third of the initial capital, the employees another third; for the rest, Guy Dadou called upon local savings: every year, about 60 people invest in the company the 5000 francs that the Monory Law allows as an income deduction.

This time, however, the increase is too large; to go from 7.37 to 13.6 million francs, the enterprise called in more conventional investors (Banexi, Institut de Participation de l'Ouest, SDR, and Banque de Bretagne), who will make it possible to invest some 80 million francs in the construction and outfitting of three new buildings, one of which will be a large testing facility.

The "new formula" circuits will enable the components sector to export 50 percent of its production, while the systems sector will produce higher performance, customized circuits.

For the internal operations of the enterprise, Guy Dadou will retain the same formula: participation of the personnel in capital, flexible schedules, open-door policy, and free-speech panels; all of these have resulted in a 4 percent absenteeism rate, despite a high proportion of female employees. Since its creation, no one has left Sorep, in spite of some dozen weddings. Invited to each one of them, Guy Dadou fully expects to invite the entire personnel to the union of Sorep and its two American partners.

11,023
CSO: 3102/190

NORSK DATA: RECORD SALES FOR NORWEGIAN FIRM

Interview With Director

Oslo POLYTEKNISK REVY in Norwegian Feb 82 pp 6-7

[Interview with Rolf Skår]

> [Text] "I am well pleased with last year," says Rolf Skår, administrative director of Norsk Data, beaming. And he has every reason to be: the total turnover went up to 475 million [kroner], 52 percent higher than in 1980. Of that amount, 245 million was in Norway, an increase of 60 percent. The incoming orders broke all records, especially foreign orders, with an increase of 58 percent. And best of all, the surplus exclusive of taxes and extraordinary items was some 40 million kroner, or 8 percent of the turnover. Unbelievably good, measured against other Norwegian industry.
>
> Everything at Norsk Data points to the economic improvement. Right in the lobby visitors are greeted with a sign showing the day's quotation on ND [Norsk Data] shares on the Oslo stock exchange (365 kroner the day I was there.) The place is seething with activity; big announcements are in preparation (see pp 7, 22 of this number). ND is not so small any longer; with a little over 1,000 employees and $100 million in turnover, it has passed the first "magic" milestones.

[Question] What pleased you most in the year just past?

[Answer] A lot of things went well last year. If I am to pick out one single thing it has to be the big NATO order we won against 35 competitors. The first contract is for 45 million kroner, but there will be more later. I regard the order as a breakthrough for us, partly because what we are to supply is right in the middle of our product spectrum.

While some of our previous big orders, such, e.g., as computers for the F-17 plane simulator, only use our machines, this NATO order will also use large

amounts of our software for administrative data processing.

[Question] How has the integration of Comtec into ND worked out?

[Answer] When I take into consideration the fact that it was our two chief competitors that were merged, I must say that it has gone unbelievably well. ND-Comtec had a turnover of 72 million [kroner] last year, mainly ND equipment, but also including a lot of Digital equipment needed by former Comtec customers. About 70 percent of the turnover represents exports.

Europe's Only 32-Bit Minicomputer

[Question] How are sales of the ND-500 going?

[Answer] After some delays we have gotten well under way. We supplied over 40 installations last year, mostly abroad. In February we are introducing a lot of innovations in the 500 family, both in hardware and in software (see the article in this issue).

[Question] Is the ND-500 still the only 32-bit mini originating in Europe?

[Answer] Yes, and there is not much to indicate that other European suppliers are planning competing offerings of their own. What most of them are doing is producing American or Japanese equipment under license.

1,000 ND-100's Delivered

[Question] How big a production capacity has ND got this year?

[Answer] We are producing in Norway, Sweden, and France, and soon will be producing in England as well. Altogether we are counting on being able to turn out 700 to 800 central units, or 3 or 4 per workday. We have recently delivered ND-100 number 1,000. It took us about 30 months to deliver those 1,000 machines; in the next 15 months we will deliver at least another 1,000. In all, a good 2,500 ND machines have been installed as of now.

[Question] Do you have any difficulties in recruiting personnel?

[Answer] It is not going so badly. Our policy is to use Norwegians in Norway, Swedes in Sweden, and so on. But we are trying to grow abroad; we shift jobs to where we have the right personnel. The primary reason for that is that we get a better position in the countries where we produce, not just sell.

[Question] Are the software revenues beginning to be considerable?

[Answer] That is really hard to measure, because the customer interest is almost entirely on the software side, but according to the price list that makes up only 15 to 20 percent of our turnover. That is somewhat more than the amount that technical maintenance brings in. But those receipts also cost: over 75 percent of our development division (about 140 persons altogether) and all of our customer support division--except for technical servicing--are occupied with software.

More Ready-Made Systems

[Question] I see it as Norsk Data's greatest weakness that you offer few ready-made systems. I believe continued growth presupposes ready-made systems; the customers will not be able to afford to develop everything themselves. Do you agree?

[Answer] Yes, even IBM has now decided to introduce a personal computer with standardized program products. We will not meet that competition, but will grow past it. A part of the market has been gobbled up and there is nothing to do about it. We have experienced this earlier: we were once dominant in the school sector, but now low-cost solutions have taken a lot of it away from us. We should not fight against them if the customers prefer standardized programs. Our main weight must be concentrated on equipment selling for over 200,000 kroner; ND's organization fits that best.

Greatest Successes Abroad

[Question] Are you planning to offer a CP/M [critical path method] mode or a UNIX [expansion unknown] mode within SINTRAN, so that ND machines can be used with standardized software products?

[Answer] The idea is very interesting, but nothing of the kind has been decided on. As a supplement we can well imagine offering software as booksellers offer books, right off the shelf, with no customer support involved. But we must not forget that the quality of the systems is an important competitive factor in the industry; good tailor-made programs will be in greater and greater demand.

[Question] Do you believe the change of government will mean less support for Norsk Data?

[Answer] The question is unimportant. We are getting most of our important contracts abroad; that is where we are doing best. The "famous" state contracts that we got so-called "help" with here at home did not bring us much joy; we have lost them all. Just think of the Telecommunications Service, the Public Health System, the universities.

[Question] But without strong state support you would surely have been out of the competition for the state insurance agency's big contract long since?

[Answer] We have not gotten that contract; all we have gotten is permission to compete.

[Question] Do you wish to say something in conclusion?

[Answer] Yes, that the most important thing that happened last year is that our stock is now listed on the London exchange. This means that we have access to international capital and the same financing that our competitors have had all the time.

New Products

Oslo POLYTEKNISK REVY in Norwegian Feb 82 pp 7, 22

[Article by Peter Hidas: "Norsk Data Gets a Face-Lift"]

> [Text] ND is introducing important new products in three fields: two new models in the ND-500 series, a low-price variant of the ND-100, and improvements to NOTIS.

ND-500 Adapted to VAX Competition

From now on the ND-500 will come in three models, two new ones and the present top-of-the-line model. The three are called 520, 540, and 560 respectively. The 520 is a "cheap" model in which all the logic is assembled in one cabinet and the primary storage is limited to 2.25 MB [megabits]. Up to 48 terminals and 2.3 GB [gigabits] of storage capacity can be hooked up to the machine. For 805,000 kroner you get a minimum configuration of 750 KB [kilobits], 30 MB of magnetic tape, and a 300 KB disk station.

The 540 is about twice as fast as the 520, thanks to a 32 KB storage unit, but a corresponding configuration costs only 1,005,000 kroner. A 520 can easily be upgraded to a 540 on the spot.

The 560 is the big brother that can be expanded all the way to 32 MB primary storage--at least in theory. But it is not hard to reach 7.25 MB. A 560 can be controlled directly from 64 terminals. A practical minimum layout--without peripheral equipment but including some tape capacity--costs 1.2 to 1.3 million kroner.

In comparison to the other 32-bit superminimachines the ND-500 is very competitive in price and performance. Part of the secret lies in a new "multiport memory system," which makes possible more than one access to the primary storage at the same time. The problem lies more on the software side, which is not much developed as yet--but there, too, ND has made considerable advances. The software has been made more efficient, especially for multiple-user situations. All in all, a good face-lift, which was absolutely required in the competition with Digital's three VAX machines. 1981 was a VAX year in Norway; will 1982 be an ND-500 year?

Little Brother in the ND-100 Family

The other big new item is little: two new baby models in the ND-100 series. Among the initiate they have long been known under the code name "Pinnocchio"; we discussed them last November in the POLYTEKNISK REVY.

The official name is ND-Satellite. The machine looks about like a refrigerator in one of the better international hotel rooms: a box on wheels, half a meter high and 60 cm wide and deep, which weighs 75 kg and develops 500 W of heat. It is designed with an eye to the office environment: little noise and relatively modest heat generation. It can, e.g., stand under a desk.

The "refrigerator" contains no quart bottles of champagne, but an ND-100 central unit consisting of a circuit-board, primary storage, a Winchester disk, a 1.2 MB disk station, and other necessary equipment.

The Satellite is available in two variants: Model 5 with 256 KB, 13.8 MB Winchester, and the possibility of connecting 5 terminals, and Model 9 with 512 KB, 21.9 MB tape, and up to 9 terminals. The terminals can be Tandberg screens and several different recording devices: Diablo writer, Tally needle writer, Epson MX-80, or Terminet 340.

The Satellite is supplied with standard ND software: SINTRAN III/VS, NOTIS-WP, programming languages, communication procedures, etc.

The prices are interesting. A Satellite/5 box with all its contents, but without terminals, costs 170,000. This includes SINTRAN, NOTIS-WP, and a lot of basic software. With 4 Tandberg screens and a Diablo writer the price goes up to 263,000 kroner, *or 66,000 kroner per operator's position with screen.* The price per screen, in other words, is on a par with a single-operator position with micromachine.

The price picture is still more favorable for Satellite/9. The "box" costs 240,000 kroner; with 8 screens and a writer the total price is 395,000 kroner, *or under 50,000 kroner per operator's position with screen.*

The primary target group for Satellite is the present ND-100 users in administration, offices, industry, and the school system. With Satellite, ND can compete for distributed systems in the 200,000 to 400,000 kroner price class, i.e. in a field that has been closed to the ND-100 up to now.

Improved NOTIS

NOTIS is the ND-100's word-processing package, used by most of the larger ND-100 customers. Now the "package" has been redefined, and includes three different but interrelated components.

The first component is NOTIS itself, which from now on is called NOTIS-WP, and which has become more streamlined than before. And a good thing, too, for the old NOTIS was somewhat heavy and clumsy.

The second component has been known up to now as GRAFS, an unattractive name that was easy to remember. From now on the child will be called NOTIS-IR for information retrieval. It is a system for full-text search, intended for document collections, legal codes, regulations, archives, and the like. When you do not know the file number of a document you can find it by supplying some characteristic key word that occurs in the text.

The third NOTIS component is ACCESS, a system for quick reference to files. The files look like tables, and with ACCESS they can be defined, brought to light, searched through, and printed out in whole or in part. ACCESS is very reminiscent of IBM's SQL and Query by Example. The first model of ACCESS works in a relatively limited way, but the basic concept is good and promising.

8815
CSO: 3102/227

NORSK DATA INTRODUCES FIVE NEW COMPUTER MODELS

Aimed at West European Market

Paris ZERO UN INFORMATIQUE HEBDO in French 15 Feb 82 p 1

[Text] All is not glumness in data processing, and the minicomputer sector (especially its 32-bit top-of-the-line quadrant) continues to expand. The Norwegian manufacturing firm Norsk Data has recently chosen London in which to underscore its European orientation, highlight its successes, and introduce five new models.

Norsk Data in 1981 had total sales of 475 million Norwegian kroner (the krone is currently worth around 1 French franc), up more than 50 percent over the preceding year. The Norwegian firm exports around half its production. Until now the Oslo-based firm has centered its sales effort essentially on the final user market (the European Nuclear Research Center at Geneva is one of its best-known customers), but hopes now to increase its cooperation with the services-marketing and systems-marketing companies so as to expand its OEM [original expansion manufacturer?] sales.

It is with this in mind that the firm has introduced two new bottom-of-the-line (16-bit) models: The Satellite 5 and Satellite 9, which are actually "packaged" versions of the ND-100.

At the top of the line, its ND-500 (32 bits), renamed the ND-540, has spawned the ND-520 and ND-560. All of this hardware is geared to the Sintran III/VS multimode, multi-user system of operation.

According to the Norwegian builder, these models are comparable in power to the Prime 850 and to Digital Equipment's most recent VAX 11/782 biprocessor.

New Models Described

Paris ZERO UN INFORMATIQUE HEBDO in French 15 Feb 82 p 3

[Article by Gerard Schmitt]

[Text] In an effort to enlarge its European market, Norsk Data last week chose the British capital in which to announce the latest additions to its

product line. Its catalog has been re-edited and enlarged to include five new computers based on the design and the technology of the older members of their family, the ND-100 and ND-500.

The new additions include, at the lower end of the line, two 16-bit machines--the Satellite 5 and Satellite 9--which are "packaged" versions of the ND-100, the prices of which appear to be around 50 percent lower than those of their nearest competitors.

At the top of the line, the ND-500, renamed ND-540, has sired two other 32-bit models: the 520 "bridled" version, and the 560 "muscled" version, the latter offering, according to the Norwegian builder, performance characteristics better by 50 percent than those of the Vax-11/780 at a nearly equal price.

The line now includes, therefore, listed by order of power, the Satellite 5, Satellite 9, ND-100, ND-100CE, ND-520, ND-540 and ND-560.

A noteworthy feature is that all these models operate on the same Sintran III/VS multimode, multi-user system and its subsystems, and accept Basic, Cobol 74, Fortran 77 and Pascal languages.

Distributed Networks

The Satellite 5 and Satellite 9, whose appellations indicate they are primarily designed for integration into distributed networks, are in effect ND-100 "packages" accommodating respectively 5 and 9 peripherals (screen and keyboard, or printer). The first has a 256K central memory, a 1.2M floppy disk drive, and a 13M Winchester disk.

The second has a main memory capacity of 512K and a 21M Winchester disk. Both models are equipped with either one or two HDLC [high-level data link control] lines and will, as a standard feature, accept--besides the basic version of the Sintran operating system--Notis-WP word processing software.

Available options include accessory gear of various kinds, enabling the remote entry of data or programs, accessing and updating data bases, the design and testing of scientific or management programs, etc.

The price of the basic configuration is around 240,000 French francs for the Satellite 9 and 161,000 French francs for the Satellite 5; the latter model, with four screen and daisy-wheel printer terminals is offered at around 260,000 French francs.

As for the three top-of-the-line systems sired by the ND-500, their architecture is the same as that of the latter.

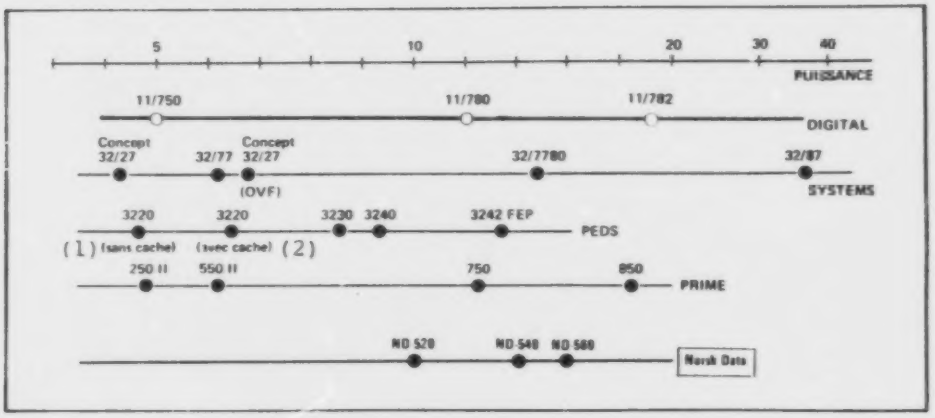
Quick Calculations

Each of them has two processors: one ND-100 which handles the input/output operations, the task programing function, and the allocation of system resources; the

Norsk Data	1981	1980	1979	1978	1977	1976
Total sales (in MCN [million Norwegian kroner])*	475	313	215	161.6	111.9	80.7
Exports (percentage of total)	50	49	46	36	46	42
Net profit before taxes (in MCN)*	40	28.1	12.8	10.9	7.3	4
Profit margin (percent)	8.2	9	6	6.8	6.5	5

(Source: Norsk Data)

* 1 Norwegian krone = 1 French franc approximately



Key:

1. With storage and retrieval.

2. Without storage and retrieval.

second processor, an ND-500, is dedicated almost exclusively to calculations. It is recalled here that the general characteristics (memory management system, instruction set, etc) of this machine were discussed in ZERO UN INFORMATIQUE HEBDO No 538).

With performance figures around 0.9 MIPS [million instructions per second], the Model 520 rates as a "bridled" version of the 540 (formerly ND-500). With a 0.75M memory, expandable to 2.25 M, it is housed in a single cabinet. Its price in the basic version, is 800,000 French francs (overall).

Model 540 differs from the foregoing essentially in that it is equipped with a 32K storage and retrieval memory. Its power is then 1.9 times that of the 520.

In its basic version, it lists for 1 million French francs.

Lastly, Model 560, with performance ratings (1.75 MIPS) similar to those of the 540, can accept from 512K to 32M of memory and use a storage and retrieval memory expandable to 128K. It can take up to 64 terminals.

Its base price is 1.2 million French francs.

9399
CSO: 3102/167

MATRA HARRIS SAMPLES FASTEST 16 KBIT C-MOS RAM IN WORLD

Paris ELECTRONIQUE ACTUALITES in French 19 Feb 82 pp 1, 10

[Article by J.-P. Della Mussia: "A French First in Memory Technology"]

[Text] A world premiere is taking place at MHS [MATRA [Mechanics, Aviation and Traction Company] Harris]. This firm is currently sampling a C-MOS [complementary metal oxide semiconductor] 16-Kbit (2K x 8) RAM [random access memory] that features the best speed/energy consumption compromise available on the market, with an access time of 55 ns [nanoseconds] (max) and a power requirement of not more than 0.1 mA [milliampere] at rest. By comparison, the fastest 16-Kbit C-MOS available until now has been that of a small American firm, IDT's 6116 (90ns) followed by Hitachi's HM 6116 LP (150 ns).

This disclosure coincides with four other major events at MHS: A rise in mass production of its C-MOS 4-Kbit RAM's (1 million chips had been produced as of October 1981; 2 million had come of the production lines by mid-December); the putting into production of an improved SAJI IV technology in the chip component thickness range below 2.5 microns (approaching the H-MOS II) that improves the performance of memories while lowering their cost; the bringing out of MHS's first N-MOS [n-channel MOS] circuits (the 8048); and the creation of a joint marketing network with Harris in Europe. MHS thus finds itself well armed to resume the C-MOS offensive in the face of the current Japanese attack. This is all the more so since the French company has available to it the Harris sales network in the United States, for its innovative products as well as for circuits produced jointly with its American partner owing to much lower production costs in France. These American and European marketing networks will also be open to MHS's future N-MOS products.

Only Static Memories

The launching of MHS's C-MOS 16-Kbit fast RAM is important from several standpoints. Being the first company to introduce such a product, MHS will be able to sell it at a price reflecting the industrial reality at MHS and not at a virtually imposed Japanese price that in general does not enable Western companies, in times of crisis, to realize a profit, even considering only their marginal costs. It also proves that MHS has a good technological capability that should enable it to

innovate, from the hardware standpoint, with respect to other circuitry. And thirdly, MHS has been using this technology since the end of December for its 4-Kbit memories, a change that should enable it, in the very future, to more than double its number of good chips per production run, and hence to compete on equal terms with the Japanese companies on circuits that will be at the very top of their product lines for 1 or 2 more years to come yet.

The advent of this memory is also important to users, who are constantly after the fastest possible circuits for their microsystems. The fact is the market currently offers only either pure C-MOS memories with at-rest power requirements of the order of 10 microamperes but slow (MBB 417: 200 ns; TC 5516 AP: 250 ns), or rather fast pure N-MOS memories with at-rest power requirements exceeding 10 milliamperes (M 58725: 150 ns; MK 4802-70: 70 ns; 21881: 65 ns). MHS's HM 65161 memory uses, in its chip, an N-MOS core (memory cells consisting of 4 transistors + 2 high resistances) and C-MOS peripheral circuits, providing, in principle, a good chip speed/power requirement/surface area compromise as compared with the two other formulas. This solution was first proposed by Hitachi 2 years ago. MHS's memory is simply an improvement in the speed of that memory, the improvement being such as to even beat the speed of the pure N-MOS models. The 65161 is entirely static and is of the asynchronous type, unlike another model, the 6516, which is synchronous; the latter is currently being sampled by Harris and will be produced by MHS at Nantes in December 1982. MHS has adopted an asynchronous formula because at least 80 percent of the market currently demands this type to augment system speeds. Current static N-MOS memories are moreover of the asynchronous type.

MHS is also studying a model configured around 16K x 1 and another around 4K x 4, which will be introduced in September and December respectively. The French company will also sample in April a 1-Kbit C-MOS memory (the 6561) configured as a 256 x 4 for use in T 83 telephones.

Still within the static RAM domain, MHS has been sampling since January a 64-Kbit (8K x 8) C-MOS hybrid model, whose 4-Kbit chips are mounted on a chip carrier at Nantes and whose mounting on a ceramic substrate is done in Malaysia.

Sampling of 80C48 Could Start in April

The technology developed for memories will of course be used by MHS for the company's other circuits, and especially its C-MOS microprocessors and their peripheral circuits. MHS is currently testing the first chips of the C-MOS version of the 8048 microprocessor which the company itself developed. If these tests prove satisfactory, the sampling could start in April (otherwise, their introduction will be delayed at least 3 months).

Concurrently, Harris in the United States is honing the C-MOS version of the 8086 for sampling, which is scheduled to begin in June, to be followed by production by the end of 1982. A series of C-MOS peripheral circuits will also be offered at that time (82C43, 82C55, 82C53, 80C88, 80C51), of which the 80C51 is being developed by Intel and will be produced under license by MHS.

MHS is moreover studying the possibility of manufacturing a C-MOS microcomputer under license and in versions designed for certain types of applications (automobiles, electric household appliances, toys, telecommunications). The company is currently investing heavily in this regard to become independent with respect to computer-assisted design and to software. (A software antenna is in the process of being installed in California).

Lastly, we recall that the sampling of a purely MHS C-MOS COFIDEC [expansion unknown] is planned for the end of 1982.

The 8048 in Production

With regard to the N-MOS circuits it manufactures under Intel license, MHS has a program for the sale of these circuits, primarily as components of kits, but above all a program for manufacturing directly from Intel masks. The first circuit manufactured (with good yields from the very first run) was the 8048. The 8048 and the 8051 will thus be exhibited at the Components Show. They will be followed in the second quarter by the 8086, and in the third quarter by the 8088.

In the bipolar sector, on the other hand, MHS has deferred its investments by 1 year so as not to spread its efforts too widely.

A Harris-MHS Sales Network in Europe

The joint Harris-MHS sales network in Europe will carry the name "Harris MHS" (see ELECTRONIQUE ACTUALITES of 15 January 1982).

Initially, the efforts of its management staff will be centered on increasing the group's direct sales: Harris presently generates 70 percent of its total annual sales in Europe via distributor channels and 30 percent directly, a ratio that is exactly the inverse of normal (30 percent via distributor channels, 70 percent directly). The reversal of the current situation should also have the effect of increasing Harris's exports to our own continent, which presently total $25 million annually, or 20 percent of its total annual sales.

Memories With Redundancy: Not Always Viable

MHS will adopt redundancy for its 16K x 1 static RAM's, but not for its 2K x 8 memories. Redundancy actually entails an increase in chip surface area and a loss of speed which vary according to the memory's configuration.

For a 2K x 8 chip, in the case of one flaw, a built-in redundancy stack must be used and one point in eight of the stack must be matched to the fault. This entails a loss of 5 to 7 ns, or 10-15 percent, of access time, which is substantial. Redundancy is therefore not viable unless there are many flaws, and production run yields must be increased.

For a 16K x 1 memory, on the other hand, multiplexing among bits in the redundancy stack is not necessary and the loss in access time owing to redundancy is of an order no greater than 1 nanosecond. Moreover, the increase of chip surface area does not exceed 2 percent. In this case, therefore, redundancy is unquestionably an enhancing factor.

9338
CSO: 3102/168

ELECTRONICS

FIVE-YEAR PLAN ANNOUNCED TO AID ELECTRONICS INDUSTRY

Paris LE MATIN in French 12 Mar 82 p 5

[Article by Christian Menanteau]

[Text] The government's objective: rebalance this sector's deficit in 1986. A strategic branch if there ever was one, the French electronics industry is being treated with solicitude: beginning this year, the government will put 480 million francs in the public assistance pool for research and development in this sector. This is a prelude to a five-year plan (1982-1986) announced Wednesday by the Council of Ministers: a little boost, which was essential in view of this sector's deficit of 600 million francs last year. The avowed goal of the government is to achieve a trade balance in the microelectronics field before 1986.

Faced with a very scattered industry, where several public companies are competing for portions of the market as well as to avoid the piecemeal erosion of their prerogatives, the government is still finding its way. The French electronic industry, confronted with the American and Japanese challenge, is indeed in disarray: Thomson feudalized, CII-HB faced with delicate deadline problems, and Matra which plays on the various existing trends in order to get its share. Since 1977, the year of the first five-year plan, the administration has been hesitant about major options. At that time, the government had launched a first French components plan hinged around five points: three existing enterprises (a joint subsidiary of Thomson-CSF and the Atomic Energy Commission, Thomson-CSF, and Compelec, a subsidiary of the Dutch company, Philips), and two newly created ones (Eurotechnique, born from the union of Saint-Gobain and National Semiconductor, and Matra-Harris). The government's investment amounted to 742 million francs.

Pierre Dreyfus' proposals are also aimed at increasing the national potential and at infusing integrated circuits within the industrial body. This, as well as the introduction of electronic components in automobiles, the audiovisual sector, games, and so on. The proposals cover two phases: beginning in 1982, 480 million francs will be distributed among five ministries, with industry and defense receiving the lion's share of 230 and 100 million respectively. The avowed goals being the development of integrated circuits, notably silicon and gallium arsenide, machines, bubble memories, and low temperature circuits. In addition, a privileged financing

purse is open for projects that do not fall within this plan; it should amount to 340 million francs. The second phase, still not fully defined, covers the 1983-1986 period. Under the promising title "Development Plan for the Components Industry," an interministry group for integrated circuits, GICI, will release its conclusions in July.

According to experts in the Ministry of Industry, the worth of the French microelectronic industries is estimated to be 2.2 billion francs in investments, and 3.4 billion for research and development in the next five years. These sums represent a two-fold increase in the effort that has been made so far, but the powerful interests involved, and especially the fact that these sectors are among the rare profitable fields in the world, demand a most rapid definition of a true comprehensive strategy on the part of the French electronic industry.

11,023
CSO: 3102/190

FRANCE'S POSITION IN WORLD ROBOT MARKET SKETCHED

Paris AFP SCIENCES in French 11 Feb 82 pp 21-22

[Unsigned article]

[Text] Paris--Industrial robots are 20 years old in the United States. In France, their development came much later and the market remains poorly developed, with a limited number of manufacturers: today, one out of two robots comes from abroad.

Credit Commercial de France (CCF) is preparing a study of about 100 pages on industrial robots, whose sales have soared in the last 10 years. The study first examines their place in automation, then considers their development and their market.

This is a strongly growing market (+ 30 percent per year), where the first manufacturers were the Americans but where once again Japan pioneered, stimulated by its automobile industry. Thus from 1977 to 1979, Japanese demand was twice that of the United States.

Through the years, the United States made up for this lag since its demand has come much closer to Japan's (130 million dollars compared to 175 million in 1981). These figures do not begin to match projections for the 1990's: American demand is estimated at between 800 million and 2 billion dollars and Japan's at 1.15 billion.

Europe looks like a stepchild with the exception of Sweden, which now has the highest number of robots per capita. It was the first European country to adopt this technology, so as to maintain its productivity in an industry where manpower costs were extremely high. According to CCF, this trend was also encouraged by unions which saw it as a means for eliminating monotonous or undesirable jobs.

Other European markets have developed more recently, later than in Japan and the United States. The first market to grow was in Germany, followed by Italy and France, with a small British market in last place.

Therefore it is not surprising to find three Swedish enterprises among Europe's seven major suppliers. However, it is an American Enterprise, Unimation, which leads the old continent with 23 percent of the European market, followed by a Norwegian company (Trallfa with 17 percent of the market), with the three Swedish concerns coming next.

French domestic demand remains small (100 million francs in 1980). For top and middle of the line, the market was strongly affected by the appearance of Renault in the mid-70's, when this company devoted considerable amounts of money (15 million dollars according to CCF) and five years of effort to the field.

In fact Renault is the only French manufacturer offering a complete line of robots, and the only one with intelligent robots. It is in a position to export to the United States and Asia. By around 1983 it should become one of the world's major producers with 650 units (compared to 150 in 1981).

Far behind Renault is their sole French competitor, the former production workers' cooperative, AOIP. While it produced only 15 robots in 1980, AOIP reached a production of about 40 last year, and its robot turnover should amount to 100 million francs by 1983-84.

In the future, the French picture for top and middle of the line could be modified by the appearance of new manufacturers -- there is talk of Manuhrin, a Matra subsidiary -- without being radically affected.

11,023
CSO: 3102/194

INTERNATIONAL PARTNERSHIPS FORMED FOR R&D IN ROBOTICS

Paris ELECTRONIQUE ACTUALITES in French 19 Feb 82 pp 1,3

[Article by G. Bidal: "Robotics at Stage of Developing Major International Alliances"]

[Text] The last several months have seen a mushrooming of cooperation and licensing agreements in the domain of robotics, principally among Japanese and European builders. France, however, has remained dangerously out of it all. If this gap is to be closed in a domain in which our country cannot afford the luxury of playing the game alone, some cooperation agreements will have to be signed within the next few months.

Robotics market studies are proliferating without any noticeable betterment, however, in their reliability. The most recently dated one by the CCF [Credit Commercial de France] has the merit of having relativized the figures it adduces: It puts Japanese demand at $175 million in 1982, that of the United States at $130 million, and that of the European market approaching $100 million. These figures can be taken as a basis for further study. But beyond that, everything boils down to pure conjecture in view of the newness of a market whose growth will depend largely on the success of the research currently under way. Based on the CCF study, an order of magnitude of $1 billion may be assumed for each of the three mentioned markets--the Japanese, the European and the American.

One certainty is that the market exists and that its growth rate today exceeds 30 percent. Besides, the time is not one for arguing over figures but rather one for defining strategies. During the last few months, the robotics industry has entered into its structuring phase. New partnerships, like those already in place between Fujitsu-Fanuc and Siemens, and between Kawasaki and the American firm Unimation, have come into being under the form of marketing agreements providing generally for the granting of manufacturing rights and for joint developmental efforts: Kobe Steel with the Norwegian company Trallfa, the world's leader in painting robots; Daido with the American company Prab-Versatran; Dainichi Kiko with the British firm Sykes; General Electric with Hitachi and the Italian firm DEA [Digital Electronic Automation]; Westinghouse with Olivetti's robotics subsidiary OSAI [Olivetti Systems for Industrial Automatization]; Fanuc with General Motors and the British "600 Group"; Nachi-Fujikoski with the German firm Kuka; United Technologies with the German firm Nimak; Murata with Prab-Versatran; Mitsubishi with the Austrian firm Voest-Alpine.

This list is not exhaustive and should lengthen considerably over the next few months: The Swedish firm ASEA [Swedish General Electric Corporation], a European leader, could join up with the Japanese firm Yaskawa; the British group GEC [General Electric Company, Ltd.] and its subsidiary Hall Automation are putting into place an ambitious investment plan that is to involve technical and commercial agreements with the Japanese firms Hitachi and Yaskawa.

Rarely has a budding market given rise so rapidly to such a worldwide interleaving of industrial interests. This can be attributed to several reasons. To begin with, the robotics industry is by its very origin linked, from the supply as well as the demand standpoints, to the using industries, principally the automobile, electrical equipment and machine tool industries. The fact that it includes such firms as Kawasaki, Mitsubishi, Hitachi, Toshiba and NEC in Japan, ASEA, Electrolux, Volskwagen and Renault in Europe, and Cincinnati-Milacron-General and General Electric in the United States illustrates this point. An infinitesimally small number of firms are dedicated exclusively to robotics; in this regard, Unimation, although the world leader, is the exception. The foreseeable entry of groups such as IBM, Texas Instruments or Hewlett Packard from the electronics industry into this market, rendered probable by the growing importance of data processing and software to robots, will in no way change this fact. Short of confining their activity solely to the electronics market--a limited one if one considers the size of these firms--there can be no doubt that their strategies will also involve alliances with the machine builders.

Another factor lending support to the development of these many alliances is that robotics is a guzzler of research and development funds. Renault invested some $15 million over a period of 5 years before producing its first robot. Despite its strategic aspect, however, the robotics market is small when compared to equipment-making industries as a whole (it could represent at most a small percent of the total machine-tools market, for example). Although its profitability is an established fact from the standpoint of the user, this is not so from that of the supplier: The fact is that only a very small number of builders have reached a point of profitability which nevertheless remains a very fragile one. As a consequence a state of relatively specialization is developing among the manufacturers (spot welding, arc welding, painting, assembling, etc). And since the multiform aspect of robotics requires at the same time the coverage of a very broad technological field, cooperation becomes a quasi-compulsory route.

This is further abetted by the fact that robots do not take very well to being marketed by simple distributional methods and, generally speaking, agitate for close-knit marketing alliances. Therein lies undoubtedly the explanation of the feeble Japanese penetration into Europe and, at the same time, of the important position occupied by the Japanese builders in the network of worldwide alliances now being put in place. The stagnant state of Unimation's robot sales in Europe, where it markets its robots only through small-distributor channels, also finds its explanation undoubtedly therein.

Is France Out of It?

This being the situation, one cannot possibly avoid a feeling of uneasiness at seeing the French builders occupying spectators' benches with respect to the vast network of worldwide alliances being put in place. There are of course some very notable exceptions, such as Renault and its American subsidiary jointly owned with Ransburg (Cybotech), and Sciaky, which is entering the American market by way of its alliance with the Alleghany Company. But at a time when the big foreign groups are maneuvering their playing pieces, we in France seem to be more occupied with examining detailed market studies in search of a supposed financially miraculous niche. Obviously, the slackness of the French market, which did not reach 200 million francs in 1981 and 50 percent of which was covered by imports, is anything but an excuse. Let us be fair: Several of our builders have been trying for some time to acquire an international dimension. An agreement is in the process of negotiation between Mitsubishi and Sciaky, which builds welding robots. In the same domain, Commercy Soudure is seeking to enlarge its distributorship agreement with Shin Meiva of Japan through a technical agreement. Mitsui is in contact with CGEE [General Electrical Equipment Company]-Alsthom. As for AOIP [Precision Instruments Workers Association], the second-ranking French builder, the major portion of whose total annual turnover already comes from foreign sales, should within the next few months be disclosing technical and marketing agreements with foreign partners. This is not to mention possible newcomers, among whom the name Manurhin (MATRA [Mechanics, Aviation and Traction Company]) keeps cropping up. But time is passing and the essential task of the Robotics Mission headed by Mr Petiteau should be to define the conditions of the insertion of the French robotics industry into this new worldwide network. That Mission will be submitting its findings in April.

9238
CSO: 3102/169

NATIONAL INDUSTRIAL ROBOTICS PLAN PROPOSED

Paris ELECTRONIQUE ACTUALITES in French 12 Mar 82 pp 1,3

[Article by G. B.: "For a National Robotics Undertaking"]

[Text] By way of a report devoted to the use of robotics in production, the CES [Economic and Social Advisory Board] has called for the setting up of a full-scale plan by the government putting in place a French "robotics undertaking." Noteworthy among the measures advocated is that of a restructuring of this industry around some of the "largest firms."

This report, called the Lasfargue Report (after its drafter and rapporteur), and calling for a vast government plan in the field of robotics that would involve a restructuring of this industry by the government, has just been approved quasi-unanimously by the members of the CES including, it should be noted, those representing private industry.

The French Lag

Addressing robotics within the general context of automation, in which it is but one link in the chain, the report sets forth France's "considerable lag," attributing it to "a technological and economic laissez-faire" that has led French industry to import over 60 percent of the robots it uses. The study points out that the French numerically-controlled machine tool population reached a total of 10,500 units at the end of 1980, versus 70,000 for the United States, 50,000 for Japan, 25,000 for the FRG, and 20,000 for Italy.

The French robot population, based on a very broad definition of robots, was 38,000 units at the beginning of 1982, with an installed value of 1.6 billion francs. Of this number, 635 robots in the strict sense of the term (fully programable equipment on more than 4 axes) are currently in use. Thus, with 0.8 robot per 10,000 industrial workers, our country ranks 6th worldwide, well behind Sweden (8 robots per 10,000 workers), Japan (6) and the United States (1.6). The French market in 1981 was 150 to 200 million francs depending upon whether those built by the AEC [Atomic Energy Commission] and Renault (for their own use) are counted. Although this market represented only 0.28 percent of the total automation market in 1980, it should grow at an annual rate of 30 to 50 percent over the next 10 years.

The report is severely critical of the government's performance up to last year, deeming its action late and the level of its planned investment in robotics too low as compared with the total of its investments in automation. The "billion for robotics" in the form of bank credits (the state having supplied 70 million francs in aid) had been spent by March 1981 and had been only partly allocated to equipment directly connected with robotics. According to the CES report, the government's action in fact amounted essentially to boosting the demand, which in turn produced a sharp acceleration of imports. On the other hand, the policy of "pilot projects backed by the CODIS [Committee for the Development of Strategic Industries] increased the French supply imbalance by favoring the most sophisticated equipment but the least suited to the basic needs of the market."

While the CES report cites as a reference the "machine-tool plan" put in place by the government, it recommends a more specific intervention by the state in the robotics domain. It recommends that this intervention "take more into account the diverse aspects of robotics and avoid assigning to the same policy and administrative structures (Ministries of Research and Industry) the function of mounting a new industrial undertaking.

For a Restructuring

A policy centered solely on demand should be replaced by a "policy of utilization" that brings together the using industries, the builders, the government, and all the social partners to formulate with precision the needs in robots and the conditions that are to govern their use (human aspects, impact on employment and skills, retraining).

What the report advocates, finding that French production has many lacunae from the standpoint of self-sufficiency, particularly in the basic components sector, is the putting in place of a complete--from components to consultative assistance to installation--"robotics industrial chain."

To set up this chain, a robotics plan identical to and supplementing the machine-tool plan should, according to the report, be rapidly put in place. The CES deems it necessary to restructure the supply end of the chain, facilitating, for example, a regrouping of the marketing activities of the small builders of small manipulators. Considering the extent of the facilities owned by the state, procured through expansion of the public sector, the robotics industry, widely dispersed at present, should, according to the report, "be structured around a few of the largest enterprises." The CES adds that the government should develop the Renault group's subsidiary ACMA [expansion unknown], enlarging the scope of its activities, currently too oriented towards the automobile industry, to include all industry.

9399
CSO: 3102/210

BRIEFS

CITROEN FLEXIBLE WORKSHOP--The Citroen flexible workshop yields a productivity (evaluated by simulation) 5.8 times that of a traditional workshop of the same capacity. This gain in productivity is accompanied by gains in performance in other domains: Fabrication time reduced from 37 days to 3; production financing costs reduced fourfold; recovery of investment 3.1 years versus 4.8; internal utilization factor over a period of 5 years 32 percent versus 2; actualized real profits from the 4th year in lieu of the 8th. From the technical standpoint, the workshop, which is equipped with machining centers, is operated in real time. It can work 24 hours a day and its central computer takes over the automatic operation of parts pallets, tools, a measuring machine, and numeric-control programs. Operational control of tools starts from a central 600-tool shop from which tooling measurements are transmitted to the central computer for automatic correction. The numeric-control programs are transferred by remote loading to the various machines. The flexibility of this workshop is such that any piece that can be inscribed in a cube measuring 500 mm per edge can be machined automatically. Reader service code 0620. [Text] [Paris MACHINE MODERNE in French Mar 82 p 61] 9399

CSO: 3102/210

SCIENCE POLICY

FINANCIAL MEASURES PROMOTE INNOVATION IN BUSINESSES

Paris AFP SCIENCES in French 11 Feb 82 pp 1-3

[Unsigned article]

[Text] Paris--Several measures for financing innovation in enterprises were announced on 4 February by Jean-Pierre Chevenement, minister of research, in an address to a session of INODEV (a mutual security society for the development of innovation).

These measures, jointly prepared by the Ministry of Research and the Ministry of Economy and Finance, affect "intermediate-term innovation loans" (MTI), participatory loans, and long-term loans. For the first two of these categories, credits and loans extended by banks are secured by INODEV, relieving the bankers of attendant risks after study and approval of applications. INODEV has thus provided backing to nearly 400 enterprises (40 percent of which were less than one year old), for about 260 million francs since the society was established in 1978.

The minister announced that MTI, whose rates were variable until now depending on the bank and enterprise involved, will henceforth be "granted at a stated set rate, corresponding to the most favorable rate prevailing on the market", which currently is 15.5 percent including all commissions.

At the same time these credits will now be extended without any requirement of financial guarantees, including personal guarantees, regardless of what the conditions may have been until now. Finally, their borrowing limit will go from 75 percent to 100 percent.

In addition, Mr Chevenement specified, ministry departments and regional public organs are authorized to extend these credits with "sector bonuses" or "regional bonuses", when the proposed innovation is in keeping with their priorities.

Government endowment of participatory loan guarantee funds has tripled in one year, and 55 percent of these funds will now be virtually automatically committed as soon as INODEV agrees to shoulder 20 percent of the risk. At the same time, INODEV will be able to increase its part to 30 percent for the most interesting applications, thus reducing bankers' risks to 15 percent.

Finally, Mr Chevenement declared, the state has decided to reserve one billion francs for long-term financing of innovation "at an extremely discounted rate" which is expected to be of the order of 13.5 percent and which will soon be announced more specifically by Mr Delors, minister of economy and finance. These credits will be allocated by specialized establishments "under the technical supervision of the Ministry of Research, and under joint conditions with intermediate-term credit currently under study."

INODEV's capital has tripled from 500,000 to 1,500,000 F. Mr Chevenement expressed the wish to see it extended to the financial community as a whole.

While retaining its acronym, INODEV will become "The Institute for the Development and Financing of Innovation", a powerful instrument together with ANVAR (National Agency for Valorization of Research), which subsidizes the research preliminary to these innovations.

For Mr Chevenement, the development of innovation, "the best and in fact the only chance of survival for PME/PMI" (small and medium size enterprises and industries), is "an inevitable phenomenon." He stated that "Japan expects that within five years, 35 percent of the industrial turnover will consist of products which do not exist today."

INODEV is presided by Roger Pujol (president of the PME equipment credit board). Vice president is Thierry Gaudin (Ministry of Research and Technology, while Bernard Daude is director general.

INTERMEDIATE TERM INNOVATION (MTI) -- NEW SYSTEM

Beneficiaries: all enterprises operating in France.
Scope: all financial requirements of an innovation program.
Duration: 2 to 10 years.

	Before 4 February 1982	After 4 February 1982
For Enterprises		
Cost	Bank intervention cost (variable by bank and enterprise), + cost of INODEV and CEPME commissions (1.25 %)	Stated set rate: basic bank rate + 1.50 % For a final cost of 15.50% on 4 February 1982 Regardless of duration Whether credit is convertible or not.
INODEV guarantee fund subscription	3% of credit amount, 2% of which is refundable on completion of operation	Eliminated
Participation in INODEV capital	---	0.1% of total credit used

Real or personal guarantees	Eventually required	Excluded
Market studies	---	Possible
For Banks		
Bank risks	0%	0%
CEPME borrowing limit	75%	100%
Conversion	Possible, according to Banque de France regulations	Possible, according to Banque de France regulations

11,023
CSO: 3102/193

BRIEFS

NATIONAL RESEARCH, TECHNOLOGY AGENCY--In its communique of 11 February, the Ministry of Research announced that Jean-Pierre Chevenement, minister of research, has appointed a study committee to specify the role and tasks of a future National Agency for Research and Technology. The communique specified that the main objective of this agency will be to federate the regional associations for research and technology which encompass researchers and members of "the nation's lifeblood," as a sequel to regional meetings which laid the groundwork for "the national symposium of research and technology," held last month, and designed to "implement the results and follow up the proposals" of the symposium. The agency will work in close collaboration with CESTA (Center for the Study of Advanced Systems and Technologies), an agency currently under study and which should become operational by the third quarter of this year. The study committee responsible for planning the National Agency for Research and Technology is composed of about twelve personalities who participated in the national symposium; its honorary president is Francois Gros, scientific advisor to the Prime Minister, and the president is Michel Callon, director of research at the Ecole des Mines and joint coordinator of the national symposium. Mr Callon will present a report to the minister of research before 31 March, the communique concludes. [Text] [Paris AFP SCIENCES in French 11 Feb 82 pp 8-9] 11,023

TECHNOLOGY TRANSFER PROCEDURE--The government has decided to institute a national control procedure on technology transfers to foreign countries and particularly to the Eastern countries. This decision has just been announced to the diplomatic press by the minister of defense, Mr Hernu. A commission under the oversight of the prime minister, with the participation of the Ministries of Foreign Affairs and Defense, will be charged with "the protection of sensitive French technologies having possible military fallout." This commission will not take the place of the control exercised by the COCOM [expansion unknown], in which France will continue to participate. [Text] [Paris ELECTRONIQUE ACTUALITES in French 19 Feb 82 p 2] 9238

SCIENTIFIC COOPERATION WITH AFRICA--Nice--"The new scientific cooperation policy between France and the African nations will rely not on transfer, but on technologic co-development, as defined by the Lagos Action Plan," declared Jean-Pierre Cot on 28 January, in Nice. The minister of cooperation and development, closing a meeting of representatives from 20 African nations, stated: "The Nice-Lagos Manifesto relies on the observation that the economic crisis of the developed nations, and that of developing ones, are two aspects of one and the same crisis." France will therefore use "self-centered" development strategies, aimed at encouraging renewal while reducing dependency. One of the participants in fact pointed out that the traditional technologic transfer policies amount to a decision that poor countries must purely and simply import the technologies of rich countries, whereas the modes of development are different. The Nice Manifesto, formulated after a three-day meeting, thus recommends the "legitimization and popularization of science in Africa," and the inception of a vast "research program for improving agricultural production systems." The African nations, it was pointed out in Nice, must equally participate in some advanced technologies, such as data processing, remote detection, and biotechnologies, which will determine their future independence. The participants stressed the need for more accessible and less expensive scientific information. They recommended the formation of an African Academy of Sciences, as well as the development of research on conventional technologies. The stated willingness of French participants to apply the recommendations formulated by the African nations during the Lagos conference, was acknowledged in Nice by Balla Keita, minister of research for the Ivory Coast, who claimed to be "very satisfied to see France become the advocate of a new international order, including in the scientific domain." [Text] [Paris AFP SCIENCES in French 4 Feb 82 p 7] 11,023

CSO: 3102/193

OVERVIEW OF SEVEN EUROPEAN AIRCRAFT INDUSTRIES

Duesseldorf VDI NACHRICHTEN in German 12 Mar 82 pp 13-19

[Article by Erhard Heckmann: "Focus on European Aircraft Industry"]

[Text] Erhard Heckmann, for many years a special correspondent of VDI NACHRICHTEN, worked as a journalist in the aviation industry after the war, specifically, as translator; he began his journalistic activity in 1959 as editor with the magazines FLUGWELT and FLUGKOERPER. In 1963, he switched to a company with commercial flight operations representing various foreign enterprises in electronics and in the aircraft industry in the FRG; he directed the operation for 7 years. His technical knowledge is derived from production, sales, and aircraft operations. Since 1960, he has not missed a single air show at Farnborough, Le Bourget, or Paris.--The Editors.

Airbus Represents Competition with the United States

With about 43,000 employees and a sales volume of more than 13 billion European currency units (1 ECU = DM2.50), the European LRI (aviation and space industry) is a hefty factor in the economy. The number of employees and the sales volume of the LRI companies in the EC thus amount to 40 percent of the figures from the United States. In coming up with the Airbus, Europe has challenged the American competition. Although the December 1981 monthly output was only 4.2 A-300 Airbus units, whereas Boeing produced more than 20 aircraft, the salesmen from Airbus Industry in 1980 were able to garner 50 percent of all orders for wide-body aircraft. In the European concert, the British aviation industry is the strongest on the Western continent.

It took 35 years to wind the British aviation and space industry down to peacetime levels after the war and to come up with an economically reasonable structure. That industry today employs more than 200,000 workers. The engine sector is particularly heavily represented with Rolls-Royce especially since this company is the only one outside the United States that comes anywhere near the American market leader, Pratt & Whitney, in terms of employees, although the sales volume is 40 percent lower. The product range offered by the equipment industry is

complete. By virtue of Great Britain's "special position" with respect to the United States--based on compensation for the purchase of nuclear delivery systems --British firms also have easier access to the American market.

Looking at it in overall terms, the most important enterprises in the British aviation and space industry today are the semigovernment system firm British Aerospace, the government-owned Rolls-Royce Ltd establishment as engine-maker, and Westland acting as helicopter producer. It is government and company policy to carry out minor projects--up to the size of the BAe 146 (see VDI-NACHRICHTEN, No 2, 1982)--on a national basis and larger ones on the basis of international cooperation.

British Aerospace sprang up in April 1977 as a result of the merger and nationalization of the aviation and space interests of Hawker Siddeley with British Aircraft Corporation and Scottish Aviation. The enterprise is subdivided into two groups, that is, the Aircraft Group which we want to look at in this report and the Dynamics Group which produces guided weapons. The concern employs 78,500 persons in Great Britain and abroad (including 2,500 in Saudi Arabia and Oman); in 1980, its sales volume came to 1.423 billion Pounds and it has orders on hand amounting to 3.5 billion Pounds. The enterprise was partly returned to private control in February 1981. The share capital is now widely scattered. Of the 115 million Pounds, 48.43 percent are in the hands of the government, 48.43 percent are in the hands of 87,500 stockholders, including 58,000 company personnel, and the remaining 3.4 percent are preferred shares for the employees.

One important reason for return to private control was the higher motivation of the personnel force because it was customary under the Labour government to grant big wage hikes also in government enterprises operating at a heavy loss--wage hikes which were way out of proportion to the earning situation of the enterprises. The taxpayer had to foot the bill.

Airbus Industry Has 20-Percent Share

The Aircraft Group of British Aerospace employes about 60,000 employees, subdivided in six enterprise divisions with nineteen plants in Great Britain and seven flight testing centers. Among the civilian programs we might emphasize the development of the BAe 146 feeder-line aircraft, participation in the Airbus (construction of wing and Chester Plant), and the Jetstream small airliner. The HS-748 turboprop aircraft and the HS-125-700 business jet are in production.

The four building lots released for the Tornado multipurpose combat aircraft encompass 476 aircraft. British final assembly is being accomplished in the Warton Plant where the developmental flying was done for the Tornado ADV air defense variant.

The Harrier VTOL continues to be much in demand. The Harrier GR Mk. 3 is in production for the RAF; the Sea Harrier is being produced for India (the aircraft for the Royal Navy have already been delivered); and additional AV-8A aircraft are being made for the Spanish Navy. McDonnell Douglas is working on the improvement of the AV-8B, with BAe as subcontractor. The VAF has ordered 60 and the U.S. Marine Corps has ordered 336 of that version. The Hawk Trainer, which in terms of

the numbers ordered had always been behind the Alpha Jet, was picked by the U.S. Navy with corresponding alterations for flight training, especially carrier operation. The delivery of 11 Nimrod Mk. 3 early-warning aircraft, converted to Nimrod Mk. 1 naval patrol [reconnaissance] aircraft, is scheduled to begin this year. This work is to be done by the Woodford Plant in Manchester.

British Aerospace participates in the Airbus program as a 20-percent partner of Airbus Industry through the production of the wing box in Chester. At a time when the British government had withdrawn from the Airbus program, the company--at that time still called Hawker Siddeley Aviation--was already making the air boxes as subcontractor, without any commercial risk. Hawker de Havilland (Australia) will supply wing ribs for the Airbus 310 on the basis of a subcontract from BAe.

Both versions of the four-jet feeder-line aircraft, the BAe 146, are being flight-tested in Hatfield. Plans call for 30 deliveries in 1983 and between 33 and 36 deliveries in 1984. The production of the HS-125-700 business jet is running at a monthly output rate of three airplanes. The new version, the Series 800, is not to get any new wing but only a wing with a greater wing span.

Westland Helicopters

The Westland Group at the time managed to escape nationalization so that this helicopter manufacturer today exists separately and privately along with the partly nationalized Airframe Industry. The Westland Group employs 12,500 workers, including 7,000 in helicopter construction. After the enterprise first of all built Sikorsky helicopters on a license basis or improved them further (for example, the Sea King, in service with the West German Navy, is a version of the Sikorsky S-61), the Lynx (also a shipboard helicopter used by the new German frigates) was the first in-house development as part of a British-French contract dating back to 1967-1968, calling for the joint development of three helicopter models--the Puma, the Gazelle, and the Lynx (at that time still called the WG.13). Project management for the first two models was handled by Aerospatiale and Westland handled the third one. The Lynx led to the WG.30 which can carry 16 passengers. The first shipments have been made, for example, to the British Airways, serving the Scilly Islands. The Sea King follow-on aircraft EH.101 is now being developed with Agusta. Other firms in this group are working on air-cushion aircraft, air conditioning systems, and hydraulic equipment.

Rolls-Royce

With 53,000 employees in the engine division and another 2,400 in the ship and industrial turbine division, Rolls-Royce is the world's second-biggest engine manufacturer. The production assortment extends from helicopter turbine construction in Leavesden via the big civilian jet engines of the RB.211 series in Derby all the way to the RB.199 military engines, Ardour, and the Western world's only engine for VTOL aircraft, the Pegasus, in Filton near Bristol.

The manpower subdivision is interesting: 46 percent are in production, 12 percent are in design, 19 percent are in the experimental division, 9 percent are in administration (including sales), 8 percent are in training, and 4 percent are in customer service.

Rolls-Royce missed the bus--if we may say so--with respect to the Airbus program. After the debacle with the RB.207--which led to the collapse of the enterprise in 1969--Rolls-Royce put its money on aircraft manufacturers in the United States. It thus became a supplier for the launching customer (first-time customer) of the Lockheed Tristar and the Boeing 757 with powerful support from British Airways, the national airline company.

A new development program is being pursued together with four Japanese firms; this is the RJ.500, an engine for the new 150-seat airliners. After Fokker and McDonnell Douglas split and since Boeing is not thinking of marketing an aircraft in that category prior to 1988, the company is pursuing this development somewhat more slowly. But regarding the Airbus 320, the company is involved in tough competition with all other engine makers throughout the world.

The Government Runs the Show in France

In-House Developments Guarantee Independence for Exports

The French aircraft and aviation industry is an important factor in the export industry and therefore has the full support of the government and its subordinate agencies not only in research and development but also in sales. The French government's attitude toward weapons exports--regardless of whether the administration happens to be conservative or socialist--is determined by a sober and practical approach.

In 1980, the industry employed almost 110,000 people, subdivided as follows: 60,100 in the airframe industry, 23,000 in the engine industry, and 26,000 in the equipment industry. The strength of the French equipment industry is particularly noticeable; it was built up systematically with the help of government support and today employs more than twice as many persons as the German equipment industry. The French aircraft and space industry's sales volume came to Fr33 billion in 1980. Goods worth FR19 billion were exported and the industry received FR27 billion in orders from abroad.

France also has two system firms, the government-owned Aerospatiale (SNIAS [National Aerospace Industry Company]) and Marcel Dassault Breguet Aviation, in which the government has been holding the majority share since the autumn after Marcel Dassault several years ago had to accept almost 50-percent government participation as a result of the belly landing with the Mercure (the domestic political clout of the manufacturers prevented full nationalization). These two companies are separated in a very simple manner: Aerospatiale handles transport aircraft and airliners as well as guided weapons and helicopters; Dassault takes care of combat aircraft and business aircraft.

Concerning the order of magnitude, Aerospatiale--with 39,000 employees and a capital stock of Fr447 million, plus a sales volume of Fr13 billion--roughly corresponds to MBB [Messerschmitt-Boelkow-Blohm]. The Airbus accounts for a considerable portion of the sales volume. Aerospatiale produces the forward section of the fuselage with the cockpit, the wing center boxes, and engine parts. Final assembly of the A-300 and the A-310 takes place in the Toulouse Plant. A new shop was build for the assembly of the first two A-310 units; it is then used for

the extension of the final assembly line of A-300 and A-310 aircraft because both versions are to be assembled in a final fashion on the same assembly line.

Helicopter production is quite considerable including the following types:Alouette, Puma, Super Puma, Gazelle, Dauphin, Dauphin 2, and Ecureuil. The missile division produces the AS.30 air-to-ground missile and the Exocet naval missile; it is developing AS.15 TT for navy helicopters, the follow-on system for the Pluton tactical nuclear missile, and the ASN supersonic naval missile together with MBB. Hot, Milan, and Roland are being produced in the context of Euromissile.

With a subscribed capital of Fr501 million, a sales volume of FR10.7 billion, and 16,000 employees, Avion Marcel Dassault Breguet works in two main areas in aircraft construction: the combat aircraft of the Mirage family and the business aircraft of the Falcon series. Dassault is the French partner of Dornier in the Alpha Jet program and it is also the partner of British Aerospace in the Jaguar program. The Mirage 2000 is being developed for the French Air Force and has already also been ordered by India. The heavy, twin-jet Mirage 4000 has not yet found any customers. If German-French cooperation were to materialize in the context of the combat aircraft for the 1990's, the TKF [Tactical Combat Aircraft], then Dassault would be the partner.

The French engine industry consists of three companies, that is, SNECMA [National Corporation for Aircraft Engine Design and Construction], Turbomeca, and Mircoturbo [as published]. Government-owned SNECMA is the biggest enterprise with 11,500 employees (excluding partner companies or subsidiaries). The ATAR family engines still account for most of the deliveries. The M53-5 is now also in production for the Mirage 2000 and the more powerful version, the M53-P2 is being developed for subsequent building lots of the Mirage 2000. More than 1,200 engines have already been ordered of the Larzac 04 model for the Alpha Jet. A partner is being sought for the development of the M88 which is planned as an engine for the combat aircraft of the 1990's. France heavily concentrates on in-house development for military engines even in case of enormous development costs because it wants to be independent when it comes to exports. An affiliate of SNECMA and General Electric is CFM [expansion unknown] for the CFM 56 program, an engine for the conversion of Boeing 707/KC-135 and DC-8 aircraft and, in more powerful versions, for the 150-seat airliners.

With 4,400 employees, Turbomeca produces mostly shaft-horsepower turbines for the helicopters of Aerospatiale and turboprops and, in cooperation with Rolls-Royce, the Ardour engines for Jaguar, Mitsubishi T-2, F-1, and the British Aerospace Hawk. The enterprise is also involved in the Larzac program.

Small turbojets made by Microturbo are used air-breathing missiles and small aircraft.

The Italian Miracle

Consolidated Industry with Clear Program

The astonishing aspect of the Italian aircraft industry is the fact that this country, in spite of its disorganized financial organization, manages, in addition

to the AMX, also to build a G.91 follow-on aircraft and moreover, with the Agusta A-129 Mongoose, to develop an AT helicopter, while the words TKF and PAH-2 (AT helicopter 2) have become the bugaboos of financial planners in the FRG. In addition, the Italians are also building and exporting the G.222 transport aircraft.

With somewhat more than 40,000 employees, the Italian aircraft and space industry in 1981 achieved a sales volume of about 1,500 billion lire, in other words, just about DM3 billion. In the Romance-language countries, people apparently believe in the blessings of a nationalized industry. In Italy, nationalization assumed a special accent by virtue of the fact that the two government finance holding companies, the EFIM [Manufacturing Industry Holding and Financial Company] and IRI [Industrial Reconstruction Institute] have been bitterly feuding with each other for many years. A settlement was worked out only last year to the effect that Aeritalia is to take care of combat and large aircraft while Agusta will handle helicopters and light aircraft. Here again of course there are exceptions which to be sure would not be a subject for this report.

The nationalization process began in 1969 with the merger of the aircraft construction activities of Fiat and those of government-owned Finmeccanica [Mechanical Engineering Finance Corporation], the Aerfer and Salmoiraghi companies, all of which were combined into Aeritalia, with Fiat and Finmeccanica each taking one half. In 1976, IRI-Finmeccanica then took over the Fiat shares and this meant that the company was fully government-owned. In 1979, the company name was changed to Aeritalia Societa Aerospaziale Italiana. At the same time, a part of the activities was shifted to southern Italy and the company headquarters was moved to Naples as part of the effort to promote the economy of the Italian South.

Combat aircraft development and construction remain in the Turin area (formerly Fiat Aviazione), in other words, the construction of the swingwing used in the Tornado as part of the three-nation project and final assembly of the 100 aircraft for the Italian Air Force. This is also where the G.91 follow-on project, the AMX, is being handled. The entire Italian aircraft industry and Brazil, through EMBRAER [Brazilian Aeronautics Company] (30 percent) are involved in this program. The engine for this close-support fighter is the 807 version of the Rolls-Royce Spey, without afterburner. Two final assembly operations--one in Italy and the other in Brazil--have been planned. The prototype is to fly in 1983. Commissioning is anticipated for 1987.

The headquarters of the transport aircraft division is at Pomigliano d'Arco (Naples), with the Pomigliano, Capodichino, Casoria, and Foggia plants. The G.222 military transport aircraft is being built here (maximum takeoff weight 28,000 kp); 70 of these aircraft have already been sold, including 44 to the Italian Air Force. For Libya, the General Electric T64 turboprop engines were replaced with Rolls-Royce Tyne for embargo reasons.

In contrast to most other European countries, the Italians initially did not think that the Airbus would have any great chances of success so that Aeritalia participated in the Boeing 767, the competitor of the A-310, at its own risk. For American aircraft, Aeritalia produces the vertical fin with rudder, elevator, spoilers, wingtip caps and mobile parts of the wing, many of them consisting of

CFK (carbon-reinforced synthetic material); Aeritalia is one of the biggest producers (and perhaps even the biggest producer) of sandwich material parts for civilian aircraft. But the company also works for Boeing competitor McDonnell Douglas, including the fuselage shells for the DC-9-80, vertical fins for the DC-10, and, on the basis of a subcontract from the McDonnel Douglas subcontractor, the Convair Division of General Dynamics, it makes fuselage shells for the DC-10. It is therefore only logical to expect participation in the A-320 150-seat Airbus.

Now that both governments have agreed on the joint execution of the project, Aeritalia and French Aerospatiale are pursuing the development of the 40-50-seat turboprop aircraft for regional traffic, the ATR-42. This effort is aimed at the market of the Fokker F.27 and the BAe 748, a market which each year sells an average of 30 aircraft worldwide. But when governments are behind such an effort, customers can be "ordered to step forward." As part of its reorganization, Aeritalia has now also inherited Partenavia and it a partner in Aeronautica Macchi and Meteor. Aeritalia's annual sales volume in 1980 was 277 billion lire (about DM55.4 million); for 1981, it has been estimated at almost 340 billion lire (DM680 million).

After last year's capital increase from 18 to 118 billion lire, the Agusta Group is now more than 80-percent government-owned via the financial holding company called IFIM. The rest is held by the Count Agusta who has managed to grab all export business (the group's export share is 78.5 percent) in the form of Agusta International. The company employs 9,500 persons, primarily for helicopter construction. In 1980 the sales volume was about 450 billion lire (about DM 900 million).

The program includes license construction of the Bell 206 JetRanger and the Bell 212 helicopters, the Boeing Vertol Chinook, and the Sikorsky S-61. Agusta is now the only producer for the Sikorsky helicopter. The A-109 was the first in-house helicopter to be developed. The Sea King follow-on model, the EH-101, is being developed together with Westland. The first of five prototypes for the A.129 Mongoose AT helicopter is to fly in June of next year; the plant hopes to be able to export it also to Germany. The Agusta Group also includes SIA Marchetti and Caproni Vizzola.

Belgian Aircraft Industry's F-16 Output Sputtering

The following also applies to the Belgian companies: full employment at this moment but an uncertain future. Apart from the Belgian assembly line in Gosselies, the Belgian companies rather got the short end of the stick when it came to distributing the construction job on the General Dynamics combat aircraft under the F-16 joint production program because only Belgium, among the participating countries, had an engine company in the form of the FN (National Factory) in Herstal. This means that Belgium had to concentrate mostly on engine building.

Belgium handled the final assembly for the 116 F-16 aircraft for the Belgian Air Force and the 58 aircraft for the Danish Air Force. Sonaca [expansion unknown] is also making parts, turning out the tail end and the vertical fin, while SABCA [expansion unknown] makes the tail end.

Production Break due to Money Shortage

Final assembly in Gosselies is scheduled to run out by the end of 1984. Considering the raw materials and parts involving long delivery deadlines, Belgium at the end of 1981 already had to place orders for additional F-16 aircraft as replacement for the obsolete Mirage aircraft. Due to a shortage of funds, the Belgian government had to postpone the decision--Dassault is still in the running with the Mirage 2000--until 1986 and that means an interruption in production. A promise had been given, to be sure, to help the industry over the "no-job" period but one can easily figure out what an industry can think of such promises when the government keeps changing.

The oldest Belgian aircraft company is SABCA which was founded shortly after World War I. Its part-owners today are Dassault and Fokker. The Haren and Gosselies plants employ 2,100 persons. About three-quarters of the sales volume comes from Haren and 25 percent come from Gosselies which primarily handles final assembly, overhauls, repair, and initial flight testing because an airfield is available there. The actual production effort is underway in Haren. For the F-16 Program, SABCA produces the wing box, the hydraulic servocontrols, and the final control elements. For the Alpha Jet, it produces the fuselage sections, for the Mirage F1 it produces fixed vertical and elevator surfaces, for the Boeing 737 it produces hydraulic regulating units, for the Airbus it produces Krueger flaps, and for the Fokker-F-27 Friendship it produces outboard wings.

Sonaca has been in existence only since the spring of 1978 as a receiver company for S. A. Fairey which had gone into bankruptcy a year earlier. The Belgian company participates in it to the extent of 50 percent. FN holds 24.4 percent, followed by AIT [expansion unknown] Electronics with 12.2 percent. The rest are divided among ACEC [expansion unknown], SABCA, and Cartonex. The company employs about 2,000 workers. Broken down by programs, 50 percent of the sales volume consists of F-16 aircraft, 25 percent consist of Mirage F1, 5, and III, while 3 percent consists of the Alpha Jet. Furthermore, 350 workers are employed in making parts for the Airbus (Krueger flaps). A new shop is under construction for the production of synthetic components.

Although involved in the J79 follow-on program for the Starfighter, the establishment of the FN engine division--which acquired a worldwide reputation primarily through weapons production--took place very quietly. In this way, one of the world's most modern production enterprises sprang up in nature, providing jobs for 2,600 workers. The plant makes ten Pratt & Whitney F100 engines for the joint F-16 production program per month. The customer is the U.S. Air Force. The F100 sales alone over a period of 5 years will come to more than 30 billion Belgian Francs (about DM1.2 billion). The worries of Sonaca and SABCA do not directly touch FN. Engine production is supplemented by basic overhauls of J79 and ATAR engines for the Belgian Air Force but it is expected that FN will also be involved in the maintenance of the F100 aircraft of the U.S. Air Force in Europe.

Fokker in Holland Facing Fresh Civilian Production Start

Stubbornness need not necessarily be a negative quality. In business however it increases the risk. When the Dutch government decided in the past--urged on by

Fokker, the nation's producer--not to join the Airbus consortium, but rather to use considerably larger amounts for the construction of a domestic project with a partner from the United States, the industry proved to be ready to face risks. Salesmanager D. Kroog was hired away from Airbus Industry and made program manager; after an impressive (and expensive) presentation at the 1981 Paris aviation show, the joint design team in Long Beach for the project of the 150-seat MDF-100 was beefed up to 400 men.

Early in February 1982, this partnership broke up. Fokker's expenditures for the project so far would seem to have exceeded about 200 million Guilders. After this debacle, all Fokker could do was to go back to the Airbus where partners are still wanted for the 320 project.

The Dutch enterprise, whose principal partners are Northrop with 20 percent, a Belgian bank consortium with 13 percent, a Dutch consortium with 10 percent, and the Begerhaut family, after separation from VFW [Fokker United Aeronautical Works], currently employs about 8,800 workers. The sales volume would seem to be 1.2 billion Guilders for 1981. The oldtimers F-27 Friendship and F-28 Fellowship are still in production with a monthly output of, respectively, two and one-and-a-half aircraft. After the discontinuation of the MDF-100, increased efforts are to be made for the modernization of both of these models. It nevertheless remains doubtful whether the market for this aircraft category can be expanded because, after all, Aeroitalia/Aerospatiale are also crowding into that market now and British Aerospace is also established in it with the BAe 748.

Concerning military aircraft production we might report that the F-16 program--in whose context Fokker handles final assembly of all the aircraft for Holland and Norway, also producing the mid-section of the fuselage and movable wing parts--is included in the plan and that the Dutch government is stepping up its orders year after year, thus assuring domestic industry of a rising compensation share.

Aircraft for Special Requirements

Sweden's Aircraft Industry at the Crossroads

> The Swedish aviation industry, which began to develop its own aircraft only during World War II--until then, Sweden had been making American, British, and German models on a license basis--is subjected during these weeks to a decision by the administration as to whether the country should in the future build its own combat aircraft designs or whether, saving the money needed for development, foreign models should be made on a license basis. Considering Sweden's special operational requirements, top military commanders recommend the development of a Swedish "JAS" model as the follow-on aircraft for the "Sk.60" and the fighter-bomber version of the "Viggen" which can be used as fighter, reconnaissance aircraft, and fighter-bomber by means of rapid conversion. Parliament is to take up the final decision in May.

In the past, Swedish military aircraft have always been distinguished by their progressive originality. The Saab-21A fighter-bomber from the year 1943 had a center cabin and a double tail assembly carrier, as well as a pusher propeller and an ejection seat for the pilot. The Safir trainer came out immediately after the war; it was sold to 20 countries although the number of aircraft sold was not large. The Saab 29, the "Flying Barrel," flew already in 1948; it had a jet engine and swept wings--ahead of the American model. The Saab 32 Lansen from 1955 already had a search radar. At that time, the prototype of the Saab 35 Draken already had a delta wing and air intakes far forward. In 1960 it was ready for issue to the units. It was followed as a no less spectacular design by the Viggen, a fighter-bomber with swept wings and canards--here again the first design of this kind in the world. The Viggen today exists in the following versions: AJ-37, a fighter bomber; SF-37, a reconnaissance aircraft; SH-37, a naval patrol aircraft; SK-37, a two-seat trainer; and JA-37, an air superiority fighter which is still in production. There is one feature that was common in all of these aircraft: the engine was built on a license basis, first of British and later of American origin.

The pending decision involves JAS, a joint project of the Swedish industry. To be able to build an adequate number of aircraft, the size, in other words, the weight was limited from the very beginning, specifically, not only via the price--no more than 60 percent of the Viggen aircraft price and only half as heavy as the latter (in other words, 8.4 t)--as well as the selection of the engine. Here it was decided rather early to pick the General Electric 404J, a more powerful version of the engines of the McDonnell Douglas F/A-18 with a thrust of almost 80 kN with afterburner. The aircraft frame is to consist of 30 percent of sandwich materials (carbon-fiber-reinforced and, for the radome, glass-fiber-reinforced synthetic materials); compared to the conventional metal structure, this makes it possible to achieve a weight saving of 25 percent.

The control system is digital-electronic by means of fly-by-wire. The design calls for a delta wing with unattenuated, attached canards, in other words, reduced stability in the subsonic range. The weapons payload is to correspond to that of the Viggen. Because no separate reconnaissance version is to be developed, the reconnaissance equipment must be capable of being carried along on the outside. The development of the multipurpose radar is being handled by L. M. Ericsson, while SRA [expansion unknown] is responsible for the radar screens and instruments in the cockpit.

The typical Swedish requirements include a short takeoff run of 500 m, which means an operational capability from 1,000-m improved runways (sections of highway), long takeoff readiness by means of a powerful auxiliary turbine, and above all easy maintenance by draftees who at least are to be in a position to replenish the ammunition of the aircraft and to refuel them. The specifications furthermore call for a supersonic capability in all flying altitudes.

The Swedish aircraft industry--in other words, the Saab-Scania, Volvo Flygmotor, L. M. Ericsson, FFV [expansion unknown], and SRA Communications (an affiliate of L. M. Ericsson)--have declared themselves ready to provide in-house funds for this product, specifically, for the preliminary phase and for development to the tune of 200 million sk [Swedish Crowns] (about DM100 million), after the administration had made the same large amount available in June 1980. This financing is to run out in 1982.

To become more independent of the periodic fluctuations in the military trade, the enterprise concept of Saab Aerospace calls for achieving a 50 percent sales volume share in the civilian sector. The enterprise is thus participating in foreign civilian projects as subcontractor. The company is making the flaps for the McDonnell Douglas DC-9-80 and it is making control surfaces for the British Aerospace 146.

The most ambitious project which Saab-Scania has tackled is the joint development of the 34-seat feeder-line aircraft model 340, together with the American firm of Fairchild. The Swedish enterprise bears the main burden with 70 percent and has erected a completely new production shop with a surface area of 250,000 m^2 plus 5,000 m^2 office space in Linkoeping. The amount of 200 million sk is being invested for this aircraft project alone, plus of course the machinery. The 340 model is powered by two General Electric CT7-5 turboprop engines with 1,175 Wkw [shaft kw?]. Here are some additional data: cruising speed 480 km/hr, range 1,280 km; required takeoff run less than 1,200 m, cabine overpressure 0.5 bar, maximum takeoff weight 11,340 kp.

Right Partner for Feeder-Line Aircraft

In weighing the risk of this kind of undertaking, the first question was why one should pick Fairchild as partner, of all things. Why not a manufacturer of general aviation aircraft? Why not one of the well-known makers of airliners? Well, Saab-Scania had a good reason for its choice of partners. Although the American company in the distant past became known only through the license construction of the Fokker Friendship, it nevertheless since its takeover by Swearingen--the maker of such well-known aircraft as Metro II, Merlin III, and IVA--has good sales experiences on a difficult market which is not known to the makers of large airliners. The potential customers do not keep Boeing, Lockheed, Douglas, or Airbus aircraft. At most, only British Aerospace, De Havilland of Canada, and Fokker are on this special commuter market.

Whether the prediction that the worldwide need for aircraft in this category is around 2,000 is correct, that is something only the future will show. The past at any rate shows that the calculations of the market researchers in the aircraft sector are roughly comparable to the probabilities of the weather bureau. At any rate, Linkoeping is prepared for a monthly output of seven 340 models. The 6,000 employees at Saab Aerospace in 1980 achieved a sales volume of about more than one billion sk. By the way, during the postwar years, Saab went underground; most of the metal-cutting production phase is 40 m under the granite. It is realized today that such a plant does not offer adequate protection against direct atomic weapons hits. But the machine tools are on solid foundations.

Civilian Developments Being Promoted

Another division of Saab-Scania is also concerned with aviation technology; Saab Jonkoeping employs about 1,000 workers and is involved in the development and construction of training instruments, target illustration systems, simulators, gyros, sights, and electronic components.

Volvo Flygmotor is an affiliate of AB Volvo, Scandinavia's biggest industrial enterprise. Volvo Flygmotor employs about 2,900 persons. The 1980 sales volume of

757 million sk is proof of the vast production program. The RM8B engine is currently in production for the JA 37 Viggen; this is an improved version of the RM8A, the military version of the Pratt & Whitney JT8D with an afterburner developed by Volvo. Volvo is also looking to civilian development. From Garrett TFE731, Volvo developed its military version, the TFE 1042, which could be used in light fighters in a double installation. The company has a 15-percent share in the development of the Garrett TPE3331-14/15 turboprop. If a decision should be made on the new JAS combat aircraft, Volvo would be involved in the construction and improvement of the General Electric 404. Parts production for the other engine manufacturers, such as Rolls-Royce, MTU [expansion unknown], SNECMA, Garrett, and Bendix, the equipment company, is important for sales because that accounts for 25 percent at any rate.

The company maintains a series of engine test stands. One of them should be emphasized particularly because it guarantees the testing of complete engines with afterburner at sea level at simulated Mach 1.1. The incoming compressed air is generated by means of water influx going into the underground cavern.

Only at the end of last year did the Swedish aircraft industry get together to form an association--Swedish Aerospace Industries--as a member of the AECMA [European Association of Aerospace Equipment Builders], the European Aircraft Industry Association. Sweden to be sure is located somewhat along the periphery but its aircraft industry does deserve recognition.

German Aircraft Builders Well Employed

DM-10 Billion Limit in Sales Seems to Have Been Passed--76,000 Employees

> The German aircraft and space industry will demonstrate its capacity at the Hanover-Langenhagen Airport between 18 and 25 May as part of ILA (international air show] 1982. Chancellor Helmut Schmidt certainly will not be able to be stingy with recognition for past performance in his opening address but he will not fail to sound a warning either. One cannot make any promises when one's pockets are empty. With a total of 76,000 employees, the German aircraft and space industry is rather well employed through the Airbus, Alpha Jet, Tornado, and Bo 105 production programs. The 1981 annual sales volume would seem to have topped the DM-10 million limit. The existence of the development reams is a matter of concern in view of the research and development fund cutbacks.

On the topic of entrepreneurial cooperation, Professor Gero Madelung, chairman of the MBB business management, during the New Year's reception in Ottobrunn, urged staff members who are able to do so to carry out their ideas so as to earn a profit for the enterprise. In so doing he touched on a problem which in the past was tackled in a wasteful fashion as far as the national economy is concerned and which was not handled in an optimum fashion in terms of enterprise management. There was criticism to the effect that too few marketable products were coming out of the Ottobrunn think tank. The truth is that there was an inclination to file away some discoveries from research and technology which were not suitable for marketing in the company itself in order not to give the competition any ideas;

instead, this should have been handled more cleverly by means of license awards or by founding partnership companies so as to participate in their practical production efforts.

All big enterprises are having trouble converting development results into production (this process recently has been called know-how transfer although it comes from technology transfer to other companies); and they find it even more difficult to market them. The accusation concerning the marketing and sales weakness of companies of the LRI (aircraft and space industry) is almost classical now to the extent that this involves products which cannot be offered to the chief customer, that is, the government. The wealth of ideas of the engineers is lacking in the businessmen. They often lack a sixth sense for market opportunities.

And this is precisely what Madelung means by "entrepreneurial copperation." No organizational chart in any big enterprise can make sure that the sales maturity of a particular development item will be recognized at the right time. This is where the staff members must be motivated and addressed on all levels. Of course, mere words are not enough. We must provide incentives. The word "entrepreneurial" also contains the element of risk. The staff member must be made to share in the risk to a tolerable degree--and of course also in the profits. Looking at Ottobrunn, from which social-policy suggestions have already come, we might just mention flexitime, exemplary advanced education, social welfare, and similar concepts and we expect new signals in the entrepreneurial field.

With about 38,000 staff members, an annual sales volume of DM4.6 billion, and an order inventory of DM7.6 billion MBB grew to internationally significant dimensions after the purchase of VFW. The capital was increased last year from DM278 to DM378 million; the UF [aircraft division] enterprise division for combat aircraft has 7,100 employees; the UT [transport division] transport aircraft and airliner plant division managed from Hamburg has 17,000 employees; the UD [rotary-wing and transport aircraft division] employs 5,600 persons (including the freight car construction plant in Donauwoerth); the UA [apparatus division] handles weapons and employs 4,500 persons; the UR [space division] employs 2,200 persons and is managed from Bremen; the UM [navy and special equipment division], likewise based in Bremen, employs 1,000 workers. The figure is rounded out by about 3,000 part-time workers in all divisions. Broken down over programs, we find that 10,000 workers are assigned to the Airbus, 7,500 to the Tornado, 4,900 to weapons, 4,000 to helicopters, and 2,200 to aerospace activities.

In the context of medium-term investment planning, DM1.3 billion are to be invested over the next 5 years in production plants because high wage costs and fluctuating exchange rates call for the most efficient possible production efforts. New-type automatic riveting machines are being installed in Hamburg and new production facilities are being put up for sandwich materials.

Earnings are good from the production of the Tornado combat aircraft because the company undertook the risk of concluding the contracts with fixed prices. Price escalation in this program in other words was not caused by industry and therefore need not be justified by industry. The concerns spend DM140 million per year for research and development. Starting in 1982, 25 percent more than shown in the finance plan are to be invested in R&D because these R&D expenditures are investments that constitute the prerequisites for future profits.

"MBB Facing Difficult Years" is the headline in the January edition of the in-house publication MBB AKTUELL. Well, it was impossible to charge the plant management in the past with having painted an excessively optimistic picture of the future. Nevertheless, MBB is currently in rather good shape on the whole. Airbus, Tornado, and Bo-105 are in production and even the railroad business is running well; the company is still adequately busy in aerospace activities and guided missiles are finding their market.

The problems are caused by government fund shortages. Years ago it was figured out that the production of the F-4 follow-on aircraft can be hitched up to the Tornado program but--to quote Bert Brecht--that is not the way things happen to be.

The first one to be hit is the development station for military aircraft. Here there is a personnel surplus. For a year now MBB has been pursuing the project of an air defense fighter under the overall concept of TKF which is to be superior to possible enemy fighters by a factor of two or three. The idea is to come up with a single-seater with canard wings and delta main wing, with reduced longitudinal stability and the super "Stall" and properties, direct power control, and fuselage targets [as published]. The technological targets are pegged very high but the company is also ready to pay for that or to make its own development contribution. The German equipment industry has also been urged to participate, just as the British industry is doing with the P.110 project. A foreign partner is still being sought. It might possibly come from France, especially since British industry shows no great interest due to German arms export restrictions.

The topic of in-house work by industry is in vogue during times of government fund shortages. MBB offers in-house financial participation also for the PAH-2. In a market which is really restricted by government requirements, this kind of in-house participation contains a certain degree of illogic. If the government has no money to finance a development whose only customer it is, in other words, if it denies industry a change for profitable exports, then it cannot expect industry to come up with any preliminary services without giving a guarantee which however budget law prevents the government from doing.

In the experimental program for new combat aircraft, CCV equipment plays a special role. These control configured vehicles are flying devices with reduced aerodynamics stability which are stabilized by technical control measures. The objective is not only to reduce air resistance but also to design the aircraft according to flight control or flight performance criteria. CCV [control configured vehicles] also facilitate flutter suppression when payload is carried outside and it reduces the turbulence resonance during low-level flights.

The CCV experimental program was begun in 1974. An F-104-G Starfighter was modified by means of the installation of a canard surface behind the cockpit, the attachment of a tail trim weight of 650 kg, and the installation of a quadruple redundant digital light control and regulating system. Shortly before the end of the year, the aircraft was flown with negative longitudinal stability of 20 percent (20 percent of the average wing depth behind the neutral point); this is something nobody has been able to do before that anywhere in the world.

Bo-105 Helicopter a Success

The helicopter division is running at full speed. The Bo-105 prevailed on this market, even in the United States; the licensing of the joint German-Japanese BK-117 project is in progress and the development of a light transport helicopter is with the realm of possibility. This would be 6 t Bo-108; it is hoped furthermore that a development contract might be received for the second-generation AT helicopter with France.

France is also the partner with Euromissile for the Milan, Hot, and Roland missile systems which are being made in the apparatus division. National programs on the other hand include the Kormoran naval missile as the main armament of the German Tornado naval aircraft and the WM-1 multipurpose weapon.

The integration of VFW into the MBB enterprise sector structure was not too difficult after the workshop concept which had been agreed upon even before the merger. The former VFW staff members will have to be patient for several years until they can obtain the same rights in the social benefit sector as their colleagues who have more seniority in the MBB plant store--and this in particular involves the plant retirement plan.

No Structural Problems at Dornier

The Dornier Group looks to the next several years with confidence. Although the 175th and last Alpha Jet is to be delivered to the German Air Force in the summer, production continues due to the slower acceptance rate of the French as well as export contracts. It is hoped--and this may well be unique in this industry--to create a smooth transition from Alpha Jet production to civilian production in the commuter aircraft family. This naturally does not mean that the company wants to drop military aircraft construction in the future; instead, it implies a welcome risk distribution along with growth potential.

All possible solutions for a TKF, in other words, a technical combat aircraft, as the follow-on aircraft for the Phantom, are being investigated; the concept of "follow-on aircraft" is not quite correct because the mission of a present-day combat aircraft can tomorrow certainly be taken over by other weapons, such as missiles. As we said before, Dornier still has the ball and is running with it. The company is investigating the entire spectrum, both in the context of production cooperation with Northrop, about whose scope nobody wants to comment, although we may assume that Northrop basically advocates the very maneuverable light-weight fighter, partly through the investigation of improvements of the Alpha Jet which might possibly also cover a portion of the Phantom tasks--in other words, not only air combat but also reconnaissance. Production cooperation with Dassault therefore cannot be ruled out either. There is an agreement with General Dynamics concerning the various versions of the Tomahawk cruise missile.

Among the German aircraft and space industry companies, Dornier would seem to have the best export organization. This is naturally explained by the nature of the product and the flexibility and skill of the management. Anybody who wants to sell aircraft worldwide must be able to be present everywhere. Naturally, certain main points will also take shape, such as Nigeria in Africa, as well as

in Asia--although we must not say that as yet--and Argentina of course in South America. The IA-63--an armed trainer--is one of the production cooperation projects; it was displayed for the first time at the 1981 Paris Air Show; it is an investment for the future together with the partner, the FMA, a firm of the Argentine Air Force.

The Dornier Group--one of the two family enterprises in the aircraft industry and probably the only one in the world that is still fully owned by the founder's family--employs a little more than 8,500 workers, including about 1,000 in the Lindauer Dornier-Gesellschaft mbH [Incorporated], which makes textile machinery; 4,500 workers are with Dornier GmbH; 1,550 work for Dornier Reparaturwerft [Repair Yard], and 1,500 are with Dornier Systems GmbH. The latter is mainly concerned with research and development in the field of space travel, new technologies, electronics, consultations for planning, and integrated security systems.

Development and construction of aircraft, rotary wing devices (Kiebitz biplatform), missiles, equipment for the navy and the army, as well as command systems are in progress at Dornier GmbH with primary production facilities in Munich-Neuaubing and Friedrichshafen, as well as 300 employees in Oberpfaffenhofen (final assembly). Dornier Logistik, which is a part of the corporation, increasingly accepts training assignments and is one of the enterprise's growing divisions.

The repair yard provides care and maintenance. Its job for example also includes the integration of mission electronics into NATO's AWACS. Field maintenance stations are being operated in Lagerlechfeld (GFMS [expansion unknown]) and at the Frankfurt Airport.

Alpha Jet production provided most of the sales volume which would appear to be more than DM1.1 billion (the balance sheet will not be published until July). This project, which was concluded at fixed prices, is a profit-earning proposition. It consists of about 2,500 jobs. The subsequent wind-down of Alpha Jet production is to be made up through the start and high-gear operation of commuter aircraft production (small airliners). The machinery, especially for metal cutting, is designed to facilitate that. There are 120 orders or options available, in other words, 120 delivery positions have been filled, for the small airliners with up to 19 seats. Recently, the Federal Aviation Bureau issued the model license for the smaller Do 228-100 (15 seats) just 8 months after the maiden flight.

In spite of reciprocal government agreements, the licensing authority of the United States (FAA) is setting up bureaucratic obstacles although one can expect the American license to come through soon; this is true even though FAA inquiries relate more to the number of sales units on the North American continent rather than to technical details. The Do 228-200 will follow shortly; it differs only by virtue of its longer fuselage. One of the really promising future projects being worked on by Dornier is the experimental TST (transsonic wing) which is to be used on the Alpha Jet-A that has been converted into an experimental unit with a wing characterized by a transsonic profile with a big nose radius and a relatively flat surface curvature in the forward profile sector and a stronger arch in the aft profile sector. The results of the initial flight testing phase completed in December are now available. Experimental flights in the 15° maneuver flap configuration

were carried out recently in Manching after the flight sector for all configurations had been blown corner-to-corner with and without maneuvering flap positions. The maneuver flaps, which until now could be adjusted only on the ground, are to be checked out during the next test stage in flight as a function of the flying speed and the angle of attack in order, finally, to control maneuver flaps automatically as a function of the flying state. The TST profile is 18 percent thicker than that of the Alpha Jet series-produced wing. Nevertheless, the fuel consumption is less, particularly in the faster speed range. With an integral tank in the transition between the wing and the fuselage, the TST wing gives us an action radius which corresponds to that of the series-produced Alpha Jet with two auxiliary tanks.

"Tornado"--Automated Production

The World's Currently Most Modern Aircraft Factory is in Augsburg

> The U.S. Air Force has just tackled a program for the modernization of its aircraft production enterprises under the slogan "Aircraft Factory of the Future." Here we must realize that many enterprises in the American aviation and aerospace industry do not own the plants and the production equipment. Until 1986, about $100 million will be made available for modernization from the U.S. Air Force budget; enterprises operating these plants are required to come up with a similarly large amount. Now, something which is to materialize in the United States by the middle of the 1980's is already in existence--at MBB in Augsburg.

After Great Britain, the FRG, and Italy had decided to equip their air forces with the Tornado multipurpose combat aircraft, the production effort was also distributed according to the basic principle of each country getting a final assembly facility for the aircraft it had ordered itself; production as such is handled according to the Single Source Principle, in other words, it takes place only in one location, also for the partner countries. In keeping with the stipulated construction breakdown--47.64 percent for Great Britain, 40 percent for the FRG, and 12.36 percent for Italy--British Aerospace makes all forward fuselage sections, including the cockpit, the tail section of the fuselage plus the tail assembly, and the weapons stations on the underside of the fuselage. The Italian partner, Aeritalia, makes the movable part of the wing plus flaps, rudders, and struts. The center section of the fuselage is produced at MBB in Germany with the plants of VFW, the affiliate, in Bremen getting 35-40 percent of the value.

MBB in Augsburg does the milling for the walls of the wing box made of titanium sheets, assembled by means of electron ray welding, assembled and checked out in fully equipped fashion on a double assembly line with the components made in Bremen and by other MBB plants. The aircraft's final assembly with the main structural components and engines delivered from Great Britain and Italy takes place in Manching for West German Armed Forces aircraft.

Large-Scale Projects Demand Production Cooperation

Each industrial enterprise--even an enterprise which might hold a monopoly in its own country--is subjected to competitive pressure, specifically, competition from foreign companies. Large-scale projects call for international production cooperation and a partner; anybody who cannot keep up, be it financially or technically, is no longer considered a partner, is no longer considered a system firm with equal rights, but as a subcontractor or supplier. It must therefore also be a part of government economic policy to strengthen these system firms.

The MBB enterprise management's decision to invest DM100 million in the Augusburg Plant cannot be divorced from the Tornado program. Roughly at the same time, it was also necessary to put Airbus production into high gear. There were thus two reasons to modernize the plant so that large aircraft structural components might for the first time be produced on an industrial scale: first of all, the high wage level in the FRG and, next, the development of new computer-controlled production technologies which alone assure automatic production.

In a joint project, such as Tornado, it is obvious to compare the rise in material and production costs for an aircraft in type in the FRG with those of Great Britain and Italy, the partner countries. Production costs in Germany from 1970 until 1978 went up 207 percent; in Great Britain they went up 315 percent and in Italy they rose 458 percent in terms of the particular currency. This relatively favorable increase rate in the FRG however was eliminated by changes in the rate of exchange. If we consider the changes in the rate of exchange, we get the following comparison figures: FRG 207 percent, Great Britain 134 percent, and Italy 198 percent. Compared to Great Britain, there is thus a considerable cost pressure arising in the German aircraft and aerospace industry and that pressure can be balanced out only through the most modern production methods.

The change in aircraft production in recent years, along with the abrupt rise in cutting production methods, moved automation into the realm of possibility. A comparison of the production of the mid-section of the fuselage for the F-104-G Starfighter with the mid-section of the fuselage plus the wing box of the Tornado will illustrate this.

Production Comparison

Manufacturing share	F-104G	Tornado
Cutting	14%	44%
Noncutting shaping	29%	11%
Surface treatment	6%	9%
Assembly expenditure	51%	36%
Sum	100%	100%

Compared to the F-104, the cutting expenditure for the Tornado more than tripled. This example clearly shows the transition from the differential to the integral construction method. In the past, parts of the aircraft structure were put together from many sheet metal parts by means of connection elements such as rivets and screws; today they are milled from the entire, complete material.

The computer-controlled, integrated, and automated CIAM (Computerized Integrated and Automated Manufacturing) production system, with the CIAM machining subsystem was developed for cutting. The brain of this system is a computer grouping consisting of the production control computer, which is operated from the production control stand, the operations computer and three process computers for automatic tool cycle (tool system computer), the next-higher machine control setup, the DNC (Direct Numerical Control) computer, and the material cycle (material system computer). The core of the entire system consists of 28 processing machines, mostly large-surface milling machines with up to six spindles which are controlled by the DNC computer. In order to make optimum use of these expensive machines (each has a price tag of up DM3.5 million on it), it was necessary to reduce the machine setup and preparation times to an absolute minimum. The machines were equipped with a second setup station and automatic tool exchange mechanisms. The machines are supplied with material and material is removed from them in two separate cycles.

The tool cycle is a grouping of automatic tool preparation and positioning depots, tool commissioning, automatic tool inventory depot, and tool preparation grouping controlled by the tool system computer. By means of an automatic overhead tool transport system, the magazines of the tool exchange mechanism on the machines are supplied with tools and the used tools are removed. In this fashion, 1,500 tool changes are performed each month.

Material supply is controlled by the material system computer in conjunction with the automatic material readiness depot, the material depot as such, the automatic production equipment preparation depot, and the work piece control. Material and mechanisms are transported to the machines by floor-based, inductively controlled transport carts. The chips (cutting degree about 85 percent of material input) are separated by material types, they are moved out of the shop below the floor level, and they are supplied to the recycling stage.

For wing box assembly, Augsburg has two of Europe's biggest electron ray welding systems with a ray gun capacity of 30 kw and a chamber volume of 46 m^3. Here it is possible to weld work pieces with a thickness of 100 mm together in a vacuum. By means of electron ray welding one can get a rectangular welding seam with a thickness-to-width ratio of 40:1. Rejects and warped pieces connected with complicated and heavily-cut work pieces can be avoided and, besides, the welding seam is distinguished by a high degree of purity. In a first step, two box halves, consisting of the lower carrier plate, as well as the side and front walls, are welded together and this is followed by the welding connection of the right-hand and left-hand box halves into the welded box which is annealed in the vacuum furnace and which is shot-peened for surface consolidation.

For the series production of the Tornado's fuselage mid-sections, engineers selected a line production system which is subdivided into a structure line and an equipment line. During the work process as such, the assembly objects move within a defined station time from one assembly station to the next. By means of this system one can achieve a higher degree of division of labor and a higher degree of mechanization. Structural and equipment assembly is in each case started by means of eight time steps; a double assembly line is available for the installation of the equipment, due to the longer running time. The fuselage mid-sections

are suspended in a rotatable fashion and thus assure ergonomically favorable access especially since the ideal working height can be adjusted by means of special lifting stages.

Quality Testing Integrated into Machine Operating Cycle

In aircraft construction, quality assurance throughout the entire production time is a necessity that must be properly documented. The expenditure for this purpose however can be reduced through production automation. In the assembly and equipment lines, all testing processes are integrated into the corresponding cycles. For overall electrical testing, the fuselage mid-sections run through an automatic testing station so that only completely tested and documented components leave the factory, specifically, tested from the first to the last work operation.

One thing that is striking in the Augsburg Plant is the fact that there are so few people around. All one can see is the operator (in German he is called the machine attendant) plus the engineers. Transportation is fully automated. The work stations are clean and pleasant to man. Work is being done in two shifts because the expensive operating equipment must be kept running. There is no piece work here.

A new phase in aircraft construction is approaching as a result of the use of CFK and other sandwich materials. The first two of four prototypes of a Tornado elevator assembly are being made in Augsburg; this unit is being developed by MBB together with British Aerospace. This tail assembly is distinguished by the fact that not only the skin but also the structural spars consist of CFK.

Other primary tasks in the field of new technologies include the milling of large, spherically curved honeycomb cores for highly-stressed CFK structural parts, high-speed milling of aluminum and other raw materials, superplastic shaping of titanium sheet metal parts with complicated structural geometry, and work on industrial robots as handling systems for mechanical processing, electrical production, assembly, and quality testing.

The joint European-American F-16 Production Program

The joint procurement of the General Dynamics F-16 combat aircraft by the air forces of Belgium (116), Denmark (58), the Netherlands (at first only 102, now 124 with annual release of 20-22 in each case), and Norway (72) was referred to as the "aircraft sale of the century" after the U.S. Air Force had already reported a requirement of 1,388 aircraft.

Final assembly for the aircraft to be used by Belgium and Denmark takes place in Gosselies and the F-16 aircraft for Holland and Norway are assembled by Fokker at Schiphol.

FN is providing the lion's share in license production of the Pratt & Whitney F100 engine; this order was placed directly through the U.S. Air Force which then "supplies" the engines; FN is doing this by means of supplier shipments through Kongsberg (Norway, fan drive), Disa (Denmark, reduction gears), and Philips (Holland, afterburner). In addition to those already mentioned, there are other companies which are involved in this effort (see list below).

Essential parts are also being made by General Dynamics in Fort Worth for the entire program, such as the radome with the fuselage bow, the forward portion of the fuselage with the cockpit, the ejection seat, the cockpit hood, the rudder, the vertical tail surface skin plates, and the elevator.

By the end of January 87 F-16 aircraft had run through final assembly in Gosselies and 85 had come out of Schiphol.

The program thus is precisely in the time frame spelled out years ago without any delays.

Belgium	MBLE	Radar computer
Denmark	Dannebrog	Flight control computer
		Radar operating unit
	Per Udsen	Vertical fin
	Standard Electric	Flight control part
	Jorgen Hoyer	Nose flap adjustment motors
	Quitzau	Heat exchangers
	Nea-Lendberg	Sensor components
	Rovsing & NESELCO	Fire control computers
	Radartronics	Frequency dial, 40-kva generator
	Silcon	Transformer
Holland	DAF	Landing gear
	Signaal	kadar antenna
	Oldelft	Radar screen
	Simmonds	Fuel supply indicator
Norway	Nordisk	Outside fuel tanks
	Standard Electric	IFF unit
	Raufoss	Main radar
	Kongsberg	Inertial platform
		Nonlocking brakes
		Weapons management instrument
	NERA	Radar frames

5058
CSO: 3102/230

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JPRS 80835

17 May 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 103

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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JPRS 80835

17 May 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

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ELECTRONICS

GUIDELINES FOR GOVERNMENT SUBSIDIES FOR MICROELECTRONICS

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 17 Mar 82 p 5

[Article: "Subsidies for Microprocessor Products, Conditions for Government Aid]

[Text] Frankfurt, 16 Mar--the Federal Minister of Research has published the "Guidelines, Applications of Microelectronics" (Federal Advertisements, 11 March). These guidelines announce the goals and provisions of the government's microelectronics program. Under this program, starting in January 1982, company-specific product developments in which microelectronics plays a dominant role can be subsidized, and the grants can be claimed through a simple procedure. This program, which is limited to the 3 years 1982 through 1984, is intended to induce a long-term improvement in industry's performance and competitive capability. The aim is to enable the greatest possible number of businesses, especially small and medium-sized firms, to acquire electronics knowledge through research and development projects and to develop and expand the facilities required for the application of microelectronics.

The prime subsidy amounts to 40 percent; it decreases to 20 percent for incidental supplies and equipment. The largest grant per firm during the life of the program is DM 800,000 which can be spread over several projects. Grants will be awarded to the extent funded in the federal budget; however, no company has a legal entitlement to a subsidy. Supported will be research and development programs which are directed toward products and product components in which microelectronics is the principal determinant of function in a technical sense. The bulk of the research and development must be on products which depend heavily on microelectronics.

The following costs incurred in connection with research and development projects are reimbursable at the 40 percent level:
--direct personnel costs determined as the sum of project-related gross taxable wages and salaries;
--specific charges for research and development contracts with third parties;
--specific charges for product-related consultation by third parties.

Reimbursement of all other costs incurred by the research and development project--especially material, travel, and overhead costs--is fixed at 80 percent of direct personnel costs and will be subsidized at the 40 percent rate.

Requests for support subsidies are to be made by submitting a single copy of a prescribed form to the VDI Technology Center, 40 Budapest St, 1000 Berlin 30. The request form is a part of the guidelines package. The VDI Technology center has been contracted by the Research Ministry to act as clearing agent for the requests. It can provide additional information and answer petitioners' questions. The employees of the center are to treat the requests as confidential. Requests can be submitted after 1 January 1982, and project-related costs can be computed from the beginning of the month in which the request is submitted. Costs reimbursable after 30 September 1984 will not be paid.

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BRIEFS

DISTRIBUTED ARRAY PROCESSOR--For over a year now, British scientists have been testing what is known as a "Distributed Array Processor" (DAP). The parallel processor is linked to the ICL 2980 main-frame computer in the computing center at Queen Mary College in London. The results of the first practical work induced the British Science and Engineering Research Council (SERC) to extend financial support for the DAP team at Queen Mary College until 1984. Also, according to information from Nuernberg, interested in parallel processor applications is increasing the FRG. The management of the computer center at the University of Hohenheim has volunteered to serve as coordinator for all interested parties relative to initial program developments and joint use of the DAP in London. The University is already working with a DAP simulator on the ICL 2960 main frame installed at Hohenheim. With the aid of this simulator, pertinent program tests, especially run-time determinations, are carried out for the parallel processor. In addition, the German Research Society (DFG) at the University of Erlangen has approved a data terminal with which program developments can be tested via data links to the Hohenheim computer center or directly to Queen Mary College in London. [Text] [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 29 Mar 82 p 7]

JAPANESE, BRITISH COOPERATION--As a prelude to a possible joint effort with the Japanese in their "Fifth Generation Computer" project, the British Ministry of Industry has formed a small project definition group which will develop a coordinated 5-year research program involving the government, in industry and the universities. The decision was made in January at a conference in London where four British participants at the Japanese "Fifth Generation Computer Conference" reported their impressions and conclusions before a comprehensive industry audience. The joint effort will probably cover parallel processing and high-level program language. [Text] [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 9 Mar 82 p 5] 8160

CSO: 3102/204

ECONOMICAL VARIANT OF LURGI GASIFICATION PROCESS DEVELOPED

[Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 2 Apr 82 p 7]

[Article: "Economical Gasification Even with Relatively Inert Coals"]

[Text] Frankfurt, 1 Apr--For decades coal has been gasified on a large scale to produce gas, liquid fuels and chemical raw materials. This is an economical and environmentally friendly way to use the abundant raw material coal for the needs of our time. These perspectives provided the impetus for further development work on this technology. Accordingly, new concepts have been discovered during the past decade, often with government aid, Hard technical reality has, however, forced a selection such that in the end only those processes remain which exhibit two properties: successful performances in commercial installations and the potential for further development. One of these technologies is the Lurgi gasification process which, for example, is used in South African installations. Annually, 20 million tons of coal are gasified, and from this gas 5 million tons of gasoline and diesel oil are produced.

The Lurgi gasification process uses the counterflow principle and works under pressure. Coal is fed into the pressurized reactor via sluices and migrates through the reactor in about a half hour. Oxygen and steam are injected at the bottom and flow upward counter to the coal. The oxygen burns the residual carbon in the lower part of the reactor. The hot gases rising upward from the combustion zone gasify the descending coal and are cooled in the process. This process makes efficient use of the chemical and thermodynamic gasifying conditions. The sintered ash from the rotating grate exits the reactor via an ash sluice.

Coal is a raw material with many properties. Some coals have an ash with a low melting point. When such coals are used in the conventional Lurgi process, additional steam has to be added to the gasification medium to moderate the temperature in the combustion zone to prevent melting the ash. For this case, Lurgi has developed a variant of their gas producer which no longer yields dry sintered ash but which instead produces fluid slag, thus permitting very high temperatures in the lower lying combustion zone. The same process is used in blast furnaces for making steel; thus one can see that the concepts used for coal gasification were borrowed from the blast furnace. However, it

is a difficult path from concept to a commercially mature installation. The advantages of this concept were, however, so compelling that British Gas Corp, London, and the Frankfurt engineering firm Lurgi Kohle and Mineraloeltechnik GmbH agreed to further develop the process jointly.

British Gas is a nationalized company responsible for assuring the nation's gas supply. Earlier, gas was produced from coal. Westfield, Scotland is the location of one of Britain's Lurgi coal gasification units; it supplied town gas until 1974. After conversion to North Sea natural gas, this facility ceased commercial operation. British Gas decided, however, not to shut down this facility but to continue to operate it as a development facility. Even though Great Britain is currently in the fortunate position of having its own North Sea natural gas supply, the time can nonetheless be seen when this supply will be exhausted.

In the long term, coal gasification is the only means for assuring Britain's future gas supply. Accordingly, a commercial Lurgi gasification installation was fitted with a new lower part to permit fluid-slag operation. Steam and oxygen are injected through valves at a 1:1 volume ratio. The slag is blown via a central opening into a water-filled quenching chamber.

The initial stage of this development was financially supported by U.S. firms. Since 1981, the EC has participated in the financing. The main burden of the DM 120 million expended to date has, however, been borne by British Gas with support from Lurgi. In 8 years of operation, 90,000 tons of coal have been gasified. This included some English coal but they were mainly caking coals from the eastern United States, generally of low reactivity and sometimes with high sulphur content. Coal from the Ruhr region has similar characteristics.

In the past few years, the gas producer has been operated with a throughput of 300 tons of coal per day under the most varied conditions. All data required for the design of industrial installations was gathered and processed. The bottom line from this development was a successful 90-day run at the end of 1981 which was primarily intended to--and did--demonstrate the reliability of all mechanical components.

This variant of the Lurgi gasification process expanded the latter's application possibilities considerably. The many years of operation in Westfield has also shown that the operating mode used still has many other advantages, such as high efficiency, simple gas posttreatment processes and broad operational flexibility. This flexibility makes the gas producer also suited for the next generation of power plant technology which will include coupled steam and gas turbines.

Lurgi believes that commercial maturity has been achieved; and even hard-to-process coals, for example, coals with low-melting-point ash and low reactivity could now be used efficiently to generate gas from which other valuable energy could be derived in the form of liquid fuels and electricity. The next step is the construction and operation of a larger gas producer with a throughput of 500 to 700 tons of coal per day.

9160
CSO: 3102/225

ENERGY

GOVERNMENT PROPOSES MORE FUNDS FOR ENERGY RESEARCH

Bonn DIE WELT in German 11 Mar 82 p 9

[Text] Finally, Research Minister Andreas von Buelow wants to present the Federal Government's second energy research program to the cabinet 24 March with budget appropriation increases that inspire optimism. If all goes as programmed in 1985 Federal energy research expenditures should rise to DM 3.1 billion, compared with about DM 2.0 billion in 1981.

The most dynamic item in the expenditures trend is coal research (from DM 352 million to DM 1.2 billion); this increase is mainly accounted for by greater activity in coal processing (from DM 96 million to DM 835 million). The program draft, of course, makes the reservation that appropriations be "in accordance with the federal budget and financial planning." Appropriation of funds would depend upon the approval of annual budgets by the parliaments.

Among other things, the long-unresolved breeder financing and the delayed approval of the third continuation of the Federal Government's energy program are given by the managing Federal Research Ministry as reasons for the fact that more than 1 year has passed since the expiration of the first energy research program at the end of 1980.

The new program's measures are oriented toward the following goals:
--securing mid- and long-term energy supply;
--provision and rational use of energy at total costs favorable to the national economy;
--proper and timely consideration of the requirements for environmental protection and protection of the population and employees against the dangers of energy conversion and use;
--increase in technological capacity in order to maintain economic competitiveness in energy technology.

According to the Federal Research Ministry, in the 1980's "the especially expensive problem of state research support for building prototypes and demonstration plants" for uranium enrichment and advanced reactor types (breeder and high-temperature reactor) will come to an end, so that one should be able to count on decreasing research needs.

In a critical comment on the present discussion of the increased participation of the energy sector in financing research, it is said that the financial

engagement of the electric industry in particular is "small" compared with that of other economic branches. The Federal Government emphatically supports the efforts of the Union of German Electric Works to create a group organization of the electric supply companies to promote energy research that could build on the specific solution for the (Kalkar) rapid breeder.

9746
CSO: 3102/207

COMPONENTS OF GIANT WIND TURBINE TRANSPORTED TO MAGLARP

Stockholm DAGENS NYHETER in Swedish 30 Mar 82 p 11

[Article by Gustav E. Nilsson]

[Text] Trelleborg, Monday, 29 Mar 82--Trelleborg witnessed something of a world record on Monday. The largest land transport ever seen in this country began to move through the town and, since the load was the world's largest wind power plant, it was no wonder the throng of curious Trelleborg residents sensed a world record. This was even more unusual than the enormous ferries in the harbor.

And, of course, it was exciting too. Would the dock hold up when the 388 ton steel mast was rolled from the gigantic barge to the impressive trailers waiting on land? Would the 88 m long load make the sharp turn from Hamngatan to Ostersjovagen? And would the bridges hold up during the hours it would take to reach Maglarp, about 5 km to the west, where the wind power plant should begin test operations this summer?

Well, everything went according to plan, but very slowly and the entire time the sight of the mast was just as impressive. To Nils Holgersson the picture of the gigantic pipe's movement at a snail's pace through Trelleborg must have seemed like a slow motion film of a gigantic missile in a May Day parade across Red Square in Moscow or a giant rocket from NASA. In any case, nothing bigger of its type has ever been seen in Trelleborg or in the rest of the country.

Three Days

As if that were not enough, records will be set on 3 days this week. On Tuesday the 50 meter long vanes weighing 96 tons will be transported to Maglarp and on Wednesday the final transport will be made when the machine housing including the generators, weighing a total of 239 tons, will make the slow journey to Maglarp where the foundation is already complete.

This is not the end of the excitement for Sydkraft which is primarily responsible for the construction in Maglarp, nor for people all around the site throughout the Soderslatt area. For example, when the gigantic wind

mill begins test operations this summer, will it cause ghost images on TV screens in the area? NE, which obviously means the Board for Energy Production research which is also behind the project, will attempt to calm the fears of Maglarp residents and other affected parties this week with a pamphlet stating, among other things, that the noise from the gigantic wind mill will disappear in the background noise at a distance of 500 m, that birds will not be disturbed appreciably, and that the risk of a broken vane is extremely small.

Tourist Attraction

It is hoped that all this will be proven correct this summer when the gigantic wind power plant begins test operations which will last 2 years. One thing is already clear, however: even if the alternative power enthusiasts cannot produce the desired number of megawatts, the wind power plant will be a success nevertheless.

A tourist attraction of enormous proportions is being created near Trelleborg. Even this summer there was great interest in the small wind power museum that Sydkraft had the remarkable foresight to construct in Maglarp. When the vanes actually begin to turn, an invasion of curious onlookers is expected at the world's largest wind mill near Trelleborg. Enthusiasm is already growing at the Tourist Council in Malmo: it seems that Scania now has its own Eiffel Tower.

9336
CSO: 310_/232

NEW FLUE GAS CLEANER ELIMINATES 99.8 PERCENT POLLUTION

Stockholm NY TEKNIK in Swedish 4 Mar 82 p 15

[Article by Lasse Sandstrom]

[Text] The world's most advanced flue gas cleaner is now in use. Flakt Industri AB manufactured the facility for the waste treatment plant in Malmo. Now 99.8 percent of the dust and almost all acidic components are removed from the flue gases.

"No other facility provides such purification," said Kjell Nilsson, executive vice-president of Sysav (Sydvastra Skanes Avfallsaktiebolag).

The waste treatment plant in Malmo handles 150,000 tons of waste annually. Most is household waste from eight municipalities in southern Sweden. Most of the waste is burned and provides heat for 12,000 apartments the process.

Harmful Substances

The problem with burning waste is that the smoke contains quantities of harmful particulate matter such as mercury and cadmium, as well as acidic components such as hydrogen chloride and sulfur dioxide.

Previously, some of the dust and acidic gases was removed in an electrostatic precipitator, which still is the most common method of purifying flue gas.

This purification was not sufficiently effective, however. In 1979 the National Licensing Board ordered the waste treatment plant to improve purification.

Throughout World

"We looked throughout the world for new technology," Kjell Nilsson of Sysav continued. "There was a wet process in Germany, but we did not like it because it causes enormous operational problems."

The waste treatment plant contacted Flakt Industri AB and together they constructed a facility that is the first of its type in the world. Some

of the technology exists in other industrial processes, but in its entirety the facility is totally new.

Flue gas cleaning now occurs in four stages in a dry process. From the furnaces where the waste is burned, the smoke proceeds to a cyclone-type coarse particle remover. This removes the coarsest dust particles.

Reactors

The next stage includes reactors where gaseous impurities--hydrogen chloride, hydrogen fluoride, and sulfur dioxide--are absorbed by powdered lime.

The lime-rich gas then proceeds to an electrostatic precipitator where most of the dust is removed. Finally, the gas is purified in a bag filter.

"Now the flue gas is cleaner than at oil- and coal-fired plants," Kjell Nilsson said.

The waste treatment plant satisfied the requirements of the Licensing Board by a wide margin.

Should Be Reduced

The board demanded that the hydrogen chloride content be reduced from 1,000 to 200 mg per cubic meter, the hydrogen fluoride content from 10_3 to a maximum of 5 mg/ m^3, and the particulate matter from 180 to 100 mg/m^3. Preliminary studies show that the flue gas now contains only one half or one fourth the levels established by the Licensing Board.

15 Million

The flue gas facility cost a total of 15 million kronor. The Environmental Protection Board is paying nearly half, 7 million, since the facility is of a new type. Operational costs will also be high due to the amount of lime and energy used and the bags needed for the bag filter. Tax payers must pay about 35 kronor per ton of waste.

"The waste collection fee will not be increased, however," Kjell Nilsson said.

More Energy

It is believed that the temperature of the flue gas may be reduced, making it possible to use heat exchangers and extract more energy.

"It probably will be a profitable process that will pay for itself after several years."

About 10 tons of toxic dust is collected each day at the plant. It is not yet known what will be done with this. Discussions are underway with Cementa for using the dust in building materials. At present, it is dumped on the property of the waste treatment plant.

9336
CSO: 3102/232

BRIEFS

FLEXIBLE ASSEMBLY CENTER--Robert Bosch GmbH, Stuttgart. Much industrial mass production has in the past been done with standardized, long-life production tooling. Today, in contrast, manufacturing technologies are required which permit frequent reconfiguring to produce various lot sizes of different products. According to Bosch, this requires adaptable, highly flexible manufacturing tooling which meets the following requirements: high manufacturing quality, easy reprogramming, high machine utilization, short throughput times, low spares inventory, low energy costs and decreasing personnel costs. To meet these requirements, Bosch has developed a new assembly center. Its main advantages, according to the company, are high machine utilization through use on the third shift and during pauses and simple integration in flexible assembly installations, for example, as part of a preassembly or parts assembly center, wherein Bosch sensors also permit disordered parts to be fed in. As Bosch further related on this occasion, the company has once again expanded its program on pneumatic and electric handling modules. A complete catalogue of handling modules can now be offered for automatic loading and unloading of machines and for parts transportation. The module program now includes linear pneumatic units in 3 sizes for parts weighing up to 12 kg; linear electric units in 2 sizes with 240 target positions for parts weighing up to 20 kg; pneumatic gripper rotating units in 3 sizes for torques up to 300 Ncm; electrical gripper rotating units for lifting loads up to 20 kg with 240 target positions; pneumatic short-lift sliders in 3 sizes for loads up to 1 kg; pneumatic slider units in 2 sizes up to 200 kg; electric slider units in 2 sizes with lifting forces up to 200 kg with 240 target positions; electric base rotation units in 2 sizes with lifting forces up to 250 kg and 240 target positions; freely programmable industrial robots of modular construction from standard modules in various sizes and many standard grippers and accessories in various sizes. [Text] [Frankfurt/Main FRANKFURTER ZEITUNG/ BLICK DURCH DIE WIRTSCHAFT in German 29 Mar 82 p 7] 9160

CSO: 3102/225

RESEARCH BILL PROVIDES FOR 50 TO 80 BILLION FRANCS BY 1985

Paris LE MATIN in French 31 Mar 82 p 16

[Article by Robert Clarke]

[Text] One of the year's most important bills is to be presented at the council of ministers session this morning, and discussed by parliament in May. This is the technological research and development orientation and programming bill. The bill, which is in general based on reflections and discussions of the National Research Colloquium, expresses the clearly stated intention of the administration to make a commitment to the future, by substantially increasing the French scientific and technical research program. The bill is also designed to give public research organizations a more suitable status, thus making it easier for them to handle the industrial development of their work. It offers scientists some rights, along with new duties, by involving them more democratically with a mission considered a national priority, while at the same time asking them to make an effort to popularize their work. The bill is a response to the challenges of progress. This bill should be debated by parliament quickly, so that its application may start this year.

"You will have to be an advocate for the future," Francois Mitterrand told Jean-Pierre Chevenement, when appointing him minister of research. Even during his campaign, the president had clearly stated the principles of a bold, forward-looking, and innovative development. "Science," he said, "will be the humus of our renewal, of our development, and of our liberty."

Already increases in funding and in the numbers of scientists have translated into reality this desire for a scientific and technological renaissance. The bill to be introduced into parliament is a long-term program. It is an attempt to

organize a national program to increase research funding from 1.8 percent of the gross national product to 2.5 percent of the GNP in 1985--which will mean additional spending of 30 billion francs a year.

After a discussion which seems to have been settled by the president himself, Jean-Pierre Chevenement won a valuable point: the technological research and development orientation and programming bill, which is to be discussed at the council of ministers session today, clearly indicates that the civilian research budget will increase each year by a rate of 17.8 percent in volume. This ensures a progressive form of financing.

The bill also stipulates that scientific staff levels will increase by a rate of 4.5 percent a year. The research budget, therefore, will expand rapidly. It should reach 65 billion francs by 1983, if all the funding is allocated. That could be a problem, because of the restrictions recently asked of all the ministries.

As defined by this bill, the civilian research budget covers a number of fields. It includes priority, interdisciplinary areas such as: the rational use of energy, biotechnologies, electronics, aid to the Third World, working conditions, the dissemination of French and of scientific education.

Although the emphasis is clearly placed on the importance of accelerating the industrial applications of research, basic work is far from being overlooked. Basic research should increase by an average annual rate of 13 percent between now and 1985, through a two-fold effort, both national and international (primarily European cooperation). Support is also provided for major programs in physics, astrophysics, energy, space, basic information systems, life sciences, and sciences related to man.

The bill calls for the reorganization of the major public research organizations, so that they can better achieve the goals of more vital and effective action, and also so that they can better handle the transfer to industry of work done in research laboratories. This goal-oriented research should respond more directly to cultural, social, and economic needs and interests, whether national or regional. A nonrestrictive list is appended to the bill; it includes areas such as food and agriculture, robotics, mechanics, scientific instrumentation, transport, and about a dozen other topics, areas in which work has already begun, such as nuclear power, space, or oceanology.

Research organizations will henceforth have a different legal status; they will be public facilities of a scientific and technological nature. This implies a thorough transformation of the CNRS [National Center for Scientific Research] and of other organizations of this type. The changes made will be intended primarily to orient them toward industrial and commercial activities. The expected reform, which should come about some time this year, will have a major impact on the democratization of the operations of these organizations, on the increase of their responsibilities, and on improved cooperation, both with university research programs as well as with private establishments and industry. This will be done by establishing new elements, public interest groups, which will help to disseminate and transfer knowledge. The new public research organizations will also be empowered to establish marketing firms or set up subsidiaries.

7679
CSO: 3102/229

SCIENCE POLICY

INSTITUTE PREDICTS DECREASE IN REAL RESEARCH BUDGET OF FRG

Duesseldorf HANDELSBLATT in German 23 Mar 82 p 6

> [Text] According to a study by the Battelle Institute, the 1982 FRG research budget nominally will rise only 4 percent to DM 43 billion. With an expected price increase of about 5 percent, it follows that in real terms less money will be available to the research sector in 1982 than in 1981.

The institute expects a further decline in personnel. In the middle term, the expected real decline in the research budget may be threatening to the FRG, since at the same time other industrial nations are increasing their budgets appreciably. Thus, Battelle estimates real growth of 3.7 percent in the United States for 1982, with a total research budget of $77.6 billion. High real rates of increase are also reported from Japan.

Whereas good growth in the research budgets was still noted in 1979 (Federal Government: 17.5 percent), in the following 2 years the increase was considerably less. The tendency for falling federal research and development expenditures in absolute terms, apparent since 1980, will, in view of the diminished financial latitude, likely be continued this year. The private sector, therefore, will be forced to finance more research and development using its own resources, if it is to continue to be successful in the technological competition in international markets.

According to Battelle, this implies greater efforts in applied research and development. Meanwhile, this rethinking process in the direction of greater research awareness also seems to involve many medium-sized enterprises which could come up with considerable sums for research and development. A new form of state R&D promotion (subsidy program for personnel costs), accordingly, has opened important doors in this regard.

Battelle estimates that this year the state and private sector together will invest only some 4 percent more for research than last year. In this way, the decline in the previously high nominal increases is continued (1979, 15 percent; 1980, 8 percent; 1981, 5 percent). The meager gain in 1982 will lead to a real decline in research capacities. The institute points out that this year the Federal Government, the Laender and the municipalities will provide DM 18 billion (Federal Government DM 11 billion, Laender and municipalities DM 7 billion) for research projects, or nominally barely 3 percent more than last year.

This year the private sector will raise some DM 24 billion for research and development. The Donor Association for the Promotion of German Science has estimated a volume of DM 22.9 billion for 1981, so that this year the industry will grow by a scant 6 percent nominally. The portion of the total research budget financed by industry thus rises further to about 56 percent (1979, 54.4 percent). On the average the industry now applies 2.7 percent of sales to research and development, or DM 4,000 per employee, whereas in 1975 it was only DM 3,000.

Over 85 percent of research and development by private industry is concentrated in the three large branches: chemicals (22 percent); steel, machinery and vehicle production (35 percent); and electrical engineering (29 percent). A high proportion of state financing is found in the sectors of aircraft and space technology (87 percent), mining (60 percent) and energy (30 percent).

According to Battelle, the FRG finances DM 1.0 billion in research abroad. Funding is provided by the Federal Government (85 percent) and private industry (15 percent). On the other hand, foreign investment finances DM 750 million for research projects in the FRG, mainly with private sector enterprises.

9746
CSO: 3102/207

FIAT UTILIZES FLEXIBLE MACHINING, ASSEMBLY CELLS

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 2 Mar 82 p 5

[Article by Claus Henniger: "Robocarriers and Robot Centers Make Production Flexible"]

[Text] The European automobile industry has made considerable efforts in recent years to maintain its competitiveness in international markets. To do this, it is becoming increasingly important to be able to react to changes in these markets as quickly as possible and without heavy investments. With highly automated, rigid production lines, this was possible in years past only with great difficulty and with enormous risk. In the meantime, production technology has undergone substantial improvement. Without doubt, many fundamental changes in production technology have only been achieved with the aid of newly developed computer controls and possibilities in using computers. But new manufacturing principles have now been created on this foundation, which allow a production flexibility that was considered all but impossible until now.

Two developments stand out: the use of robots, which can be grouped in machining centers or manufacturing islands, and the use of induction-controlled driverless transporters, which maintain a flexible material flow. The Italian automobile company Fiat has introduced these new technical possibilities with an astonishing degree of perfection both in engine building as well as in body production and in the assembly of mechanical parts such as axles, transmissions and engines to the body. However, as the head of production for Fiat Auto SpA, Cesare Bracco, notes, final assembly on this production basis is still facing some problems. He said that this was particularly true for the installation of parts inside the passenger compartment (seats, instrument panels, consoles).

Fiat plans to solve this problem in the future through design changes. Increasingly, subassemblies are to be premanufactured to make final assembly easier. The company has also made a start in the industrial use of optically controlled robots which, through a computer-controlled television camera system, can find drilled holes in the bodies and automatically bolt in door hinges. According to statements by Fiat, a prototype of this piece of equipment, which was developed in the Fiat Orbassano research center, can attach

two hinges "practically perfectly" in a present cycle time of 18 seconds in the Rivalta factory. As Bracco says, the company is "in the initial stage of industrialization" in crucial sensor technology for robots. As an additional piece of technical progress, Fiat also unveiled a laser welding unit which can weld the ring of gear teeth on transmission gears and which, in Fiat's view, attains considerably better mechanical standards. The company estimates that, even today, there is a saving of about DM 1.90 per unit at an hourly production rate of 300 units. It would be possible to increase the production rate of this unit to 2,000 units per hour. By 1983, Fiat plans to install five additional units in order to convert its entire gear production to the laser method.

Currently the most significant change at Fiat is the installation of induction-controlled material flow paths and the creation of assembly cells that use robots; it is an extremely well-laid out manufacturing concept which, however, requires considerable space for the lanes. First, engine building: In its Mirafiori factory Fiat is using the idea of asynchronous engine manufacture (LAM), which was developed by its subsidiary company, Comau Industrial SpA in Grugliasco near Turin. This is a combination of conventional assembly transfer lines and a Robocarrier system. In this factory, Fiat produces the basic engine for the Ritmo, X1/9 and Lancia Delta automobiles in 110 different versions.

The intent of the LAM concept is that all the identical work on each engine (for example, tightening cylinder head bolts) will be carried out on the conveyor belt, but that all the work unique to each version will be performed at workshoplike assembly stations. The Mirafiori plant consists of 10 cells, each with 12 assembly stations, and 4 automatic assembly lines with intermediate storage areas. Each day 350 workers in 2 shifts assemble 1,500 engines. Each cell is controlled by a special computer which, as a satellite, receives its instructions in turn from three main computers that control the entire plant. One of the 12 work stations in each cell functions to correct errors. An 8-kilometer long induction-controlled electric trolley system was installed to provide transport between the individual stations. The electric trolleys are remote-controlled and can be summoned and dispatched from the individual stations by pushbutton. Parking areas to the left and right of each assembly station of the cell allow waiting time at the individual stations to be reduced and also allow some freedom in the work rhythm.

At each cell there is a computerized recorder which prints out the plus and minus times of each assembly station in the cell. This enables the work group to check on itself in order to maintain planned production. During lunch breaks, the electric trolleys fetch the supply containers for components from the work stations and replace them with full ones for the next work period.

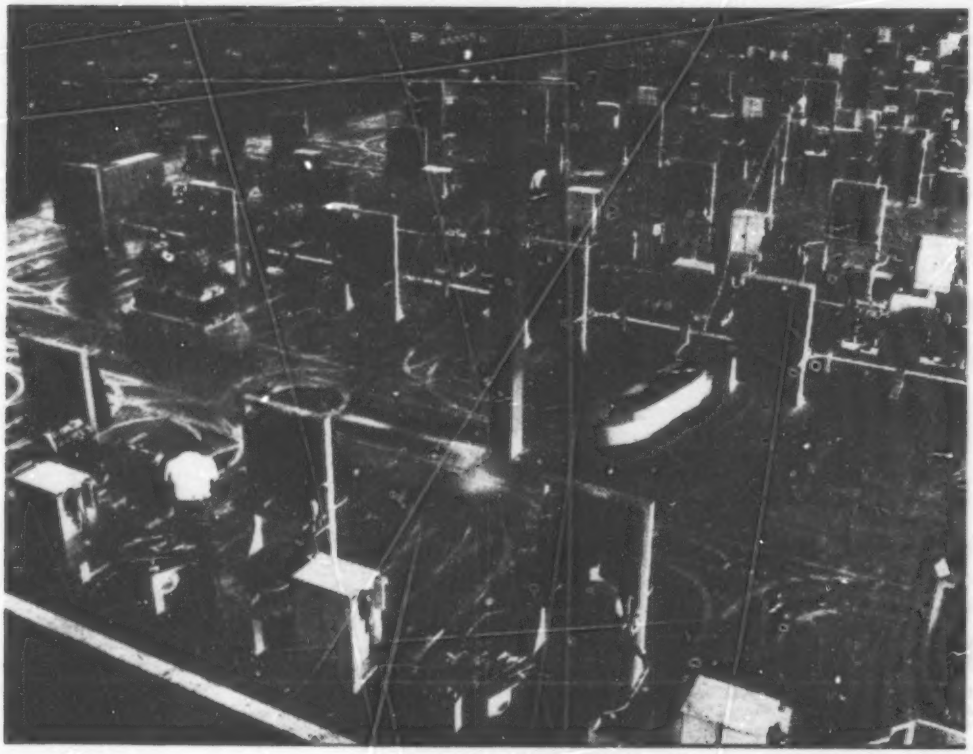
It is not hard to see that this system offers almost unbeatable flexibility concerning the mixture of engine types in manufacturing. It is very easy to switch the individual assembly points to the manufacture of new components, for example, to be able to build more engines of the types in strong demand. At the same time, assembly capacity can be adapted to the desired production volume within broad limits and withoug great expense. There were also

considerable improvements at the individual work stations: The teams can vary their own work speed, without being subject to the pressure of rigid fixed-time cycles, as is the case with assembly line manufacture. Work stations became brighter, airier, and more independent. Seen as a whole, clear progress was made in humanizing work.

Fiat is now also using a remote-controlled Robocarrier system with correspondingly larger trolleys for body assembly. The body components are rigidly attached on the trolleys and taken to gatelike welding stations (Robogate), in which several robots with holding and welding arms coming from above and from the side tackweld the components. Fiat has instituted a simple and reliable system to achieve the crucial positioning of the electric trolleys with their body shells: The body shells are raised hydraulically on the trolleys and lowered onto four solid posts in the gate. Two posts have flat surfaces. A third one has a hollow half-cylinder, and the fourth post has a hollow hemisphere as its surface. As they are lowered, the holding jigs of the body shell carriers slip automatically into the precisely correct position, which is particularly important in avoiding inaccurate welds.

According to Fiat, each Robogate can assemble two different models, allowing production to be matched with great flexibility to changes in market conditions. The investment costs for this type of welding station were naturally much higher, but model changes could be carried out with only a few parts being replaced; about 90 percent of the plant (measured against investment costs) is considered reusable. Fiat sees itself as being in a position to manufacture 2-door, 3-door, 4-door ar 5-door models in any sequence required. Retooling time for the manufacture of new models is also reduced substantially. Bracco says that it is profitable to use robots with a manufacturing volume of between 500 and 1,500 automobiles per day. Above that, automated manufacturing lines offered advantages.

It was clear that a similar system could be used to advantage in the assembly of body shells and mechanical components. Consequently, Fiat has installed a Robocarrier for this part of production in its Mirafiori factory. Electric trolleys transport pallets with all the necessary components, such as the engine, transmission and rear axle, which are then bolted to the body shell at the bolting station. An adjacent test station checks that all the bolts have been tightened correctly. Fiat notes, not without pride, that these plants are functioning "to complete satisfaction."



A new concept in engine building at Fiat's Mirafiori factory: Remote controlled Robocarriers bring the engines to the individual assembly points, which request the engines and dispatch them for transportation by pushing a button. Each of the trolleys can carry two engines. The trolleys park next to the work stations, thus clearing the way for other Robocarriers to pass. The tracks which transmit commands to the trolleys through induction magnets can be seen quite clearly.

9581
CSO: 3102/203

FRG TO REDUCE AIRBUS SUBSIDIES, WANTS MORE INDUSTRY FUNDS

Munich SUEDDEUTSCHE ZEITUNG in German 25 Mar 82 p 25

[Article: "Airbus Subsidies Are Reduced"]

[Text] Bonn--In the development and production of future Airbus versions the government will not go beyond support levels already reached. The basic decision, along with several others relating to future Airbus production and sales financing, was reached by the cabinet on Wednesday in Bonn. For the German aircraft industry, this means a greater financial involvement if it is to maintain its level of participation in a program expansion in the European Union.

The Federal Government underlined in its decision its readiness to continue to make a significant contribution to completing the current model A 300 and A 310 programs and to the improved version of the A 300, the A 300-600. The prerequisite for this is, however, that the industry assumes a greater share of the financial burden and risks of this program in the future. The Federal Government is, in addition, ready within budget constraints to cooperate as a partner in supporting the German industry in an economically feasible expansion of the program in the European Union. The Federal Government is depending on industry to continue to move the Airbus program along its charted course in a consistent and timely manner while exerting stronger industry leadership and assuming greater financial responsibility.

On the basis of this general decision, the cabinet made the following financial decisions for the Airbus Program:

For partial financing of the German development portion of the planned A 300-600 improvement program, repayable grants up to the amount of DM 165 million are provided for the fiscal years up to 1985. Plans for the overall A 300/A 310 program covering 860 aircraft authorize an acceleration of monthly delivery to 8 machines. The guaranteed support level for the model is raised from DM 2.85 billion to DM 4.1 billion. To unburden these funds, repayment to the government of all previous development costs is indefinitely postponed. MRB/VFW as partner of German Airbus GmbH is to assume limited liability for further risks in model financing. The government, however, expresses its

willingness not to take recourse on MBB/VFW if doing so would bankrupt the company. To strive to make German Airbus GmbH more independent from the mother company MBB/VFW, two government trustees will be seated on the board of directors of German Airbus GmbH in the future.

The cabinet further resolved to increase financial aid for current production sales, including an additional 48 aircraft, by up to DM 288 million to a total of DM 2,044 billion (distributed over the years to 1996). Concerning additional sales financial aid, decisions will be made by the minister of economics in concurrence with the minister of finance depending on budget constraints at the release of each production lot. In this connection, the average allocation shall not exceed DM 6 million through 1985 and DM 4 million starting in 1986. Financial aid for sales on this order of magnitude will total about DM 2.4 billion by 2004 according to Secretary Martin Gruener, coordinator for the German aeronautical and space industry. Regarding underwriting exports, the Federal Government will test each case to determine if the gains for technology and employment justify the risks associated with increased support for Airbus exports.

In connection with the Bonn cabinet deliberations on financing additional Airbus versions, Bremen Mayor Hans Koschnick requested that the chancellor ensure that the cabinet take into account the impact of its decisions on jobs in the Bremen-Hamburg area. Koschnick expressed in his letter to Schmidt the fear that the Covernment might reduce the German development portion from the present 40 percent to 20 percent for the planned model A 320, which is the next member of the Airbus family to be introduced to the market. In Koschnick's opinion, the Airbus industry has a good long-term chance, next to Boeing, of being able to supply about 30 percent of the world's aircraft demand, but only with the help of a broader production catalog extending over and beyond the models A 300-600 and A 310.

9160
CSO: 3102/266

END

JPRS 80906

26 May 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 104

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JPRS 80906

26 May 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

No. 104

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ELECTRONICS

CIT-ALCATEL ENTERS CUSTOMIZED CIRCUIT MARKET

Paris ELECTRONIQUE INDUSTRIELLE in French 1 Feb 82 pp 19-20

[Article: "Alcatel Semiconductors Comes on the Scene"]

[Text] CIT-Alcatel recently gained a foothold on the market for customized circuits by creating, several months ago, Semiconductors Alcatel (SCA) following an agreement made 20 January 1981 by which it acquired 25 percent of the capital of the American company SPI (Semi Processes, Inc).

SCA, whose main interest is customized printed circuits, pure or in the form of gate arrays, has left little room in its plans for standard printed circuits: The resale of SPI's standard DMOS circuits will account for only Fr 3 million of the Fr 28 million of turnover planned for 1983, and Fr 17 million of the FR 87 million planned for 1985. SCA will study and design circuits in all technologies, but will distribute only CMOS and will subcontract other technologies at this level.

Indeed, the interest of the CIT-Alcatel-SPI agreement seems to be primarily technological in nature, since SCA is in fact using CMOS technology with 5-micron selective oxidation on SPI gate array matrices with 300, 544 and 1,000 gates, programmable by a single metallization mask. The resulting characteristics of this technology are (typical) internal propagation times of 3 to 5 nanoseconds, input of 3 to 12 volts, and a fan out of 2. This year SPI should bring out matrices with 3-micron patterns and with two levels of interconnections, but should not be followed by SCA in this field before 1984. This is for financial (and also technological) reasons. Since the designing has already started in Villarceaux, near Paris, the rest (masks, diffusion, etching) could begin this year at the neighboring Marcoussis center, originally earmarked for ECL circuits and high-reliability HF transistors; the manufacture of wafers, handled up to present by SPI in the United States, will be performed in France, in late 1983, in a new plant in Aix-les-Bains, the capacity of which should ultimately reach 1,000 four-inch wafers per week. In terms of design, the Villarceaux center is now capable of accepting 100 gate array projects a year (half for the group's needs).

The gate array prototypes will be delivered to the user between 6 and 14 weeks after the plan is submitted and production could begin within 8 weeks after the delivery of the prototype. Finally, in order better to understand this

infatuation of CIT-Alcatel (and so many others), with customized circuits, we note the company's estimates concerning the customized MOS circuit market, as follows: In 1983 the market in Europe would be Fr 2.5 billion and should increase to Fr 3.2 billion in 1985. In France the market for gate arrays alone would go from Fr 113 million to Fr 254 million for the same years, respectively.

9380
CSO: 3102/196

EEC TO FUND R&D IN INTEGRATED CIRCUIT MANUFACTURING MACHINES

Paris INDUSTRIES & TECHNIQUES in French 10 Feb 82 p 14

[Article by Jean-Francois Desclaux: "Integrated Circuits: A European 'Machine Plan'"]

[Text] Breaking the Virtual U.S. Monopoly by 1985

True independence with respect to integrated circuits presupposes two things: mastering the basic technologies and design capabilities, but also having one's own manufacturing machines. The United States is the only, or almost the only, country in this position. The European Community wants to break up this virtual monopoly. It is rallying its forces to give itself equipment capable of satisfying the objectives of the next 5 to 10 years: attaining submicronic technologies. Adopted by the EEC Council of Ministers, a "regulation" which provides for the construction of a wafer stepper between now and mid-1984 has just entered into force. The machine will have to handle 6-inch wafers, with an exposure field of 1 cm^2 and with a line-etching precision of 1.25 microns. The output will have to be about 50 four-inch wafers per hour.

Electronic maskers will have to inscribe 1-micron lines on 15 to 20 six-inch wafers an hour. The precision of alignment will reach 0.1 micron for minimum characters of 0.5 micron.

Plasma-etching equipment is defined in terms of the materials etched: doped silica, silicon nitride, polycrystalline silicon, silicides, aluminum, metals used for interconnection and resins. The performances will be on the same order as those of other links in the manufacturing chain: 1.5 micron lines and outputs of 50 wafers per hour. The community will provide 50 percent financing for projects for researching and developing manufacturing machines. These machines also include test machines and CAD machines for designing integrated circuits in the new technologies. Thus this equipment should be built by the expiration of this plan, set for 31 December 1985. It has been noted, however, that certain research centers plan to cross the micronic threshold about 1983 and accordingly they need these machines here and now.

Two Hundred and Fifty Million Francs

Funds equivalent to approximately Fr 250 million will be granted to European companies capable of meeting the specifications set more or less provisionally

by this regulation. In fact, since they date from 1980, these specifications require some updating and are still likely to be changed following the development of the first contracts planned for the end of 1982. The invitations for bids will be published shortly in the official journal of the European Community and will be addressed to established industries in the community.

9380
CSO: 3102/136

RESEARCH INDUSTRY TO SUBSIDIZE MICROELECTRONICS

Hamburg DER SPIEGEL in German 5 Apr 82 pp 61, 63

[Text] With lots of money, Andreas von Buelow will help German industry convert to microelectronics.

In introducing futuristic technologies, Federal Research Minister Andreas von Buelow fears that German companies are not the quickest: "In the entire field of microelectronics we are bringing up the rear."

Yet, at the beginning of this year the sluggish company chiefs suddenly exhibited unusual speed. There was money to be had: Inside of 6 weeks, companies from all over Germany submitted over 400 development projects from the field of microelectronics to the research ministry.

The reason for the speed is illuminating. From 1982 through 1984 the research minister will distribute DM 300 million for the development of products in which, according to the broad definition, microelectronics is the functional determinant in a technical sense. Over half of the funds planned for this year have already been distributed.

It has been a long time since the research minister has been as generous as in this "special program:" The yearly budget is five times higher than for the earlier program "Applications of Electronics." And, contrary to the usual rule, these grants do not have to be paid back. Also, getting the money has never been easier.

On the two-page application form, not much more than address and bank account number need be given. Per the ministry's information brochure, applicants are limited to a five-page description of the project containing only the "most essential information."

Whoever fills out the forms according to instructions will have the support money in his pocket almost instantly. Whether or not the planned development is technically and economically reasonable will not now--as was done in the past--be critically checked.

The lax procedure which will bring millions to the firms could be more effective than the highly regimented methods used in the past.

Sometimes more time elapsed waiting for authorization than was required for the actual development work. Not seldom, the companies--called "aid recipients" in ministerial jargon--had to wait a year or more.

In the complex subsidy maze, large firms which could retain experts in governmental subsidy procedures came out better than small and medium-sized companies. The giants of the German electrical industry--Siemens, AEG and Philips-Valvo--divided the lion's share of the electronics support grants almost exclusively among themselves.

These firms also established the trend in technology: About half of the money which the ministry put into microelectronics (last year almost DM 120 million) has until now been reserved for building up an independent German chip production capability. Only the large companies dared attempt the expensive and complicated production of these tiny electronic circuits which can integrate the computing power of a main-frame computer on a silicon chip.

The Bonn patrons hoped that with this subsidy German industry could narrow the U.S. lead. The U.S. Company Intel marketed the first high-performance chips in 1971, and ministry staffers feared that the German users of these chips would be treated as customers of second choice by the Americans.

"Whom would you likely supply first when chips are scarce?" asks, for example, Uwe Thomas, the person responsible for electronics support in the research ministry. To him the answer is clear: "Naturally, customers in the United States since that is the largest market."

Still, 8 years of support has not made the FRG independent of foreign chip production. The result of millions in subsidies is very modest: "one or two production lines performing at world standards," according to Thomas.

Thus, Siemens can produce electronic components with the largest storage capacity achieved anywhere to date; these are designated 64-K-chips. However, in the market, the Germans are far behind in the technologically most advanced components, the MOS memory circuits. Their market share in this technology dominated by the Japanese and Americans is about 3 percent worldwide.

For the practical application of microelectronic products--for machine-tool controls or as electronic controls in auto engines, for example--the support officials have had little left over: "With such funds we would have primarily helped only the foreign chip manufacturers," said Thomas in justifying withholding such funds. Now however, the Germans must speed up the application of microelectronics if they do not want to risk falling behind in important export markets. Only 15 percent of the potential applications of microelectronics in the FRG has been realized to date according to estimates by market researchers.

For example, the Japanese realized sooner than most German companies that programable electronic controls would make it possible to use a particular machine for many different purposes. Such installations are more economical

for customers than German machines which are specialized for particular functions.

Research Minister von Buelow now cautiously concedes that the official support policy has sorely neglected the small and medium-sized companies which are just at this time making a showing in the machine building and auto accessory industries: "With us, new technologies have possibly for too long been coupled with large-scale research and large companies."

The DM 300 million program, which was adopted last fall in the midst of general budget cutting, is now supposed to salvage what can still be salvaged. "With this bow wave, we are attempting to mobilize everything possible at the product level," explained hopefully Klaus P. Friebe, chief of the VDI Technology Center in Berlin.

At the initiative of the research ministry and financed with Federal money, this special division of the Engineering Society will help small and medium-sized companies with the introduction of microelectronics and oversee the distribution of support funds.

So that the money does not again wind up just in the hands of the large companies, the subsidy is limited to a maximum of DM 800,000 per company.

This is certainly no guarantee of success. "Naturally, there will always be people who only want the money," concedes Friebe. And certainly Bonn will continue to put money into companies which propose almost any type of microelectronics development program.

The smart companies who somehow got into the microelectronics business just at the right time are the first to grab for the new special program. However, the companies which just have to have these funds cannot be helped by money alone.

Often small companies lack the ability to organize for the introduction of new technologies, and many of these companies have sunk to the know-how level of vendors only.

For this reason, the special program finances for the first time the use of outside consulting firms. The technology center with its 55 employees, most of whom bring with them experience from related industries, will transfer the art of technology management to these companies. The task requires a certain sensitivity for, as Friebe of the Berlin Technology Center knows, "One must frequently tell them disturbing truths."

They do not always want to hear the message. For example, at the beginning of the year a North German chamber of industry and commerce refused to let the employees of the technology center use their auditorium when the experts from Berlin wanted to explain the workings of the Bonn support program. The chamber of commerce gentlemen let it be known that this support program does not fit into the free-market economy.

9160
CSO: 3102/228

ELECTRONICS

SIEMENS CHIP TECHNOLOGY EXPANDING

Frankfurt/Main FRANKFURTER ZEITUNG BLICK/DURCH DIE WIRTSCHAFT in German 6 Apr 82 p 5

[Text] In the opinion of Siemens, the trend to constantly higher packing densities and better processing performance in the technology of the central units of computer systems is continuing uninterrupted. Beginning in 1982, at intervals of 2 to 3 years, there were four generations of semiconductor memories alone. The capacity of the storage modules increased each time by the factor of four. In its computers Siemens currently uses 64-K-bit modules, developed and manfactured in house. Siemens says the next generation, 256-K-bit storage chips, are now being developed by the company.

Besides software programmed microprocessors, logic components (gate arrays) are being used in the Siemens central units, whose individual specific functions are determined in the manner of hardware in the last step of production. The gate-array chip with 36 logic cells, developed and produced by the company using the so-called master-slice process, provides very high processing performance in the central units of the 7500 series. A master-slice gate array with 120 logic cells is already under development. Its gating circuit lag times will be under 0.5 nanoseconds.

According to Siemens, rapid interplay between memory registers and processing circuits is of great importance in the central unit. Accordingly, Siemens has for the first time implanted a storage field (RAM) [Random Access Memory] between the logic cells on one of its newest master-slice chips. With an access time of only 3.5 nanoseconds, it is among the fastest semiconductor memories in the world at this time.

As part of the development of large circuits into increasingly refined structures, the required electrical charges are becoming smaller and smaller. This increases the risk of "soft errors," wrong circuits which occur only occasionally and are not reproducible. They are caused in part by minimal electrical disturbances, in part created by alpha particles in the vicinity of the chips, but also by particles from omnipresent cosmic radiation. These effects would lead to several errors per day in the working memory.

Siemens plans to counter this problem in two ways: The 64-K-bit MOS [Metal Oxide Semiconductor] chips are coated with a photolithographically structurable protective layer of polyimid, developed in Siemens research laboratory, which absorbs alpha radiation. The principal measure is that the central units work with a "correction refresh" in the working memory. At regular intervals, and without the

central processor being affected, the contents of the working memory are read automatically, fed through the error correction unit and rewritten in correct form.

In the new 7.561 and 7.571 models, the pipeline principle has been expanded to five stages. Up to five commands can be run simultaneously, which, according to Siemens, corresponds to a four-fold increase in performance compared with an otherwise equally fast computer, but which is working serially.

9581
CSO: 3102/234

BRIEFS

SPECIAL MICROELECTRONICS PROGRAM--Federal Research Minister Andreas von Buelow expressed his satisfaction concerning German industry's great interest in taking advantage of the opportunities offered by the new special program "Application of Microelectronics:" The great number of proposals shows that German companies are not wanting for ideas." The companies understand that their long-term competitive capability in high-technology products is being established. This special program will aid companies which want to develop products in which microelectronics is the functional determinant. The VDI Technology Center (Budapest Street 40, 1000 Berlin 30) has been commissioned to oversee the program which was presented to the public in December 1981. Since that time, over 1,000 applications have been received by the VDI Technology Center. In January 1982, the first month of the 3-year special program, 325 development proposals with a contract value of DM 75 million were funded. The research minister was especially pleased that most of the proposals came from small and medium-sized companies. The large number of good ideas and project proposals shows the correctness of the concept which features a simplified contracting procedure to help companies develop new products based on microelectronics with the ultimate goal of opening up future markets. [Text] [Duesseldorf VDI NACHRICHTEN in German 26 Feb 82 p 2] 9160

CSO: 3102/228

SWEDISH RESEARCHERS WORK ON ELECTRICALLY CONDUCTIVE PLASTICS

Stockholm DAGENS NYHETER in Swedish 8 May 82 p 36

[Article by Lars-Ingmar Karlsson]

[Text] Plastic and electricity are hardly terms that are readily connected with each other. But now a way has been discovered to "contaminate" certain plastics in such a way that they may become excellent conductors of electricity.

A group of researchers is working with these plastics at the Stockholm Institute of Technology. Automobile batteries of plastic may be possible in the future.

For plastic to conduct electricity it must act like copper and similar metals. The negatively charged electrons in atoms of these metals are extremely mobile. They travel readily from atom to atom when a voltage is applied.

Plastics, on the other hand, are completely different from metals. First of all, they consist of several elements: carbon and hydrogen are always included, usually with oxygen, nitrogen, and other elements. Secondly, their electrons normally are bound to certain atoms so that, for example, a carbon and a hydrogen atom have two electrons in common.

Sometimes, however, two carbon atoms share four or six electrons. These carbon atoms are said to have double or triple bonds. These bonds can move from one carbon atom to another. The electrons move and it is this principle that is used when plastics are converted into conductors.

Holes Move

Having double bonds is insufficient to make a plastic conduct electricity, however. A "disturbance" is also needed for a current to flow. These disturbances may be introduced by "contaminating" the plastic with a substance that attracts electrons. In this way, there will be an electron deficiency in some bonds of the plastic. Positive "holes" are formed.

These holes move readily in the plastic when an electric voltage is applied. Of course, the movement of the holes is actually a movement of electrons

between carbon atoms. A stream of electrons flows in the plastic in the same way it would in a copper wire.

An impurity may also be used that readily releases electrons, but the result is the same when a voltage is applied.

"Conducting plastics are being developed extremely rapidly," said Goran Ahlgren, assistant professor at the Stockholm Institute of Technology.

He recently began working with the first Swedish research group in this area.

"So far, we at the institute simply have repeated what others already have done, but eventually we hope to discover new properties in these materials and develop them.

Evaporated

His laboratory now has equipment for producing polyacetylene film. The starting material in this process is acetylene, which is a hydrocarbon containing a triple bond. The acetylene can be evaporated and allowed to form a thin film, for example in a glass flask. The acetylene molecules join together and form so-called polymers.

"The thin film of polyacetylene can then be 'doped' with, for example, iodine so that it becomes a conductor," Goran Ahlgren explained.

"We want to learn to produce such films so that other researchers and companies will buy it from us. Their research must not be stopped due to a lack of film."

The polyacetylene film is extremely sensitive to air. It becomes brittle and gradually loses its ability to conduct electricity.

"One of our goals is to produce a film that is stable in air," Goran Ahlgren said.

He and his fellow researchers also are examining other conductive plastics. They have used one substance called polyparaphenyl to make a small battery in which they are measuring the current and the voltage.

Changes Color

Another substance called polypyrrole is interesting because it changes color when a current is passed through it. It changes from black to light green.

It operates in the same manner as liquid crystals in calculators.

"There probably are better substances than polypyrrole, but when the principle of its operation is known, then other materials may be 'tailor-made.' This technique could be used in large signs in which liquid crystals would be too expensive."

Conductive plastics of various materials could conceivably be used in solar cells. They could also be used to shield sensitive electronic equipment because they can absorb strong electromagnetic waves, for example from nuclear explosions.

Carpets of conductive plastics could be used to remove unwanted static electricity from areas around computers.

Automobile Batteries

It should also be possible to produce automobile batteries of plastic in the future.

"One advantage of plastic batteries is that they are much lighter than ordinary batteries. They may take up more space, however, but they may be given almost any shape and they may be put into doors, for example," Goran Ahlgren said.

He emphasized that it would take time before products of conductive plastic would be common on the market--perhaps 5 to 10 years--but there is great interest among some companies. In Sweden, both the battery manufacturer SAB Nife and LM Ericsson are following the research closely. In America IBM and Rank Xerox are involved in this field.

9336
CSO: 3102/260

AUTO INDUSTRY PREPARES TO EMPLOY HIGH PERFORMANCE COMPOSITES

Paris INDUSTRIES & TECHNIQUES in French 10 Mar 82 p 14

[Article by Alain Perez: "HP Composites: Auto Industry Prepares"]

[Text] The honeymoon between HP [high-performance] composite materials and the automobile industry has begun. Renault and the SNIAS [National Industrial Aerospace Company] have signed a basic agreement. Peugeot and the SEP [European Propulsion Company] are continuing their cooperation. Peugeot [PSA] has also just regrouped under one head its Quillery and AOP [expansion unknown] plastics divisions. The creation of a specialized research institute is under way. By 1985, the first of the auto industry's HP composite structural pieces will make their appearance. These will be hybrid materials containing 20 percent glass and 20 percent carbon fiber.

At Peugeot, high optimism reins. "It is not the price that is holding us back," its DRAS [Research and Scientific Affairs Management] is saying, "but rather the techniques of putting them into production for the high output levels we require." Initial tests on the carbon and glass suspension arm have been very encouraging. From the standpoint of resistance to fatigue, this solution is superior to arms forged from GS [expansion unknown] cast iron.

At Renault, the attitude is more cautious. "If fiber prices remain as they are now, there is little hope." According to estimates by the American producer Hercules, the present technique for producing carbon fiber by carbonization based on pyrolyzing leaves no room for a lowering of the price below 90 francs/kg, which appears still too expensive to compete with steel. The basic agreement signed with the SNIAS, however, will lead to the identification of joint working interests.

At Renault, heavy-vehicular applications are being considered, in which required production output rates are lower. At PSA, the preference accorded to Renault by ex-DGRST [General Directorate for Scientific and Technical Research] in matters of common interest still rankles. The two builders express skepticism with regard to the fabrication of carbon fiber in France. "The French chemical industry is suddenly awakening. We will buy where the price is cheapest." Most of the solutions being envisioned are based on glass-carbon mixtures. Carbon fiber is being limited to the strictly necessary. The price ratio between the two is 1 to 30.

Mass production techniques are still in the embryonic stage. The calculation and design of parts, on the other hand, are virtually mastered, thanks mostly to the experience gained in the aeronautics and space industry. In the southwest, a little PMI [Small- and Medium-Sized Businesses] has dedicated its efforts to the fabrication of oars made of carbon fiber. His object is to supply France's rowing team with competitive equipment. For the time being, the French crew is rowing in Japanese. In Normandy, one firm is using the filament winding method to fabricate tubes 12 meters in length for the district heating network of the city of Jonzac. These tubes, 50 to 250 mm in diameter, are made of glass-and-araldite composites. The latest spinoff from this HP composites flap has been the creation of a collective research institute. This institute will be part of the ravenous Ministry of Research and Technology. Initially, Bordeaux seemed well suited to accommodate it, owing to its many aeronautics installations in this sector. Today, Lyon is sailing with the wind and tide. The recent naming of Prof Gobin of the INSA [National Institute of Applied Sciences] at Lyon as head of the Materials Section of the Ministry's Scientific and Technical Mission disturbs Bordeaux's backers. In one corner of the arena there is Aquitaine together with SNIAS, SEP, Dassault and ELF [French Gas and Lubricants]. In the other, there is Rhone-Alpes with Brochier, PUK [Pechiney-Ugine-Kuhlmann Company] and RVI [Renault Industrial Vehicles]. Unless everyone gets together and agrees to select Paris...

9238
CSO: 3102/239

BRIEFS

CATHODE SPUTTERING AT RENAULT--Surface treatment is not a meaningless term at Renault. After having installed a high-capacity dichromate treatment facility (30 tons/day of hardware, the world's largest) and highly automated, the Regie has just ordered a cathode sputtering facility. It will be the first such facility installed by an an automobile maker in Europe. It is to be operational by the end of this year and will replace an electroplating installation that is presently used to chrome plate over ABS [acrylonitrile-butadiene-styrene]. With a capacity of 150 m^2 per 8-hour working shift, this new facility will need a dust-free room. The complete treatment consists of a coating of adhesive priming, the metal, and an abrasion-resistant glaze. This type of treatment will not tolerate the presence of solid particles that mar the appearance. Unlike the electroplating process, this new process rejects any defective piece categorically. Parabolic headlight reflectors, radiator grilles, door pulls and window cranks alike will all undergo this treatment. The advantages of this method are many: A large number of possible base materials (plastic materials other than ABS are usable), the deposition of all types of metals and alloys, making possible the obtention of a wide range of surface finishes, and a very substantial economy of metal. Only the portions requiring treatment are coated, and thickness of coating is measured in tens of angstroms instead of microns. Furthermore, the process is not pollutant, thus eliminating the need for treatment of effluents. Since the facility will not have to be used to 100 percent capacity for the first few months (it represents a tripling of current capacity for this type of pieces), it will amply accommodate the testing necessary for the creation of new pieces. Initially, the metal deposited will be a nickel-chrome alloy, the hue of which will closely resemble that of classic chrome, so that the new pieces will blend well with classic ones. [Article by Christian Guyard] [Text] [Paris INDUSTRIES & TECHNIQUES in French 1 Mar 82 p 10] 9238

CSO: 3102/239

PROGRAM FOR LOANS TO INNOVATIVE BUSINESSES

Paris INDUSTRIES & TECHNIQUES in French 20 Feb 82 p 12

[Article by Pierre Michel: "Innovation Loan Credits Opened"]

[Text] Supplementing the existing aids and incentives to innovation being distributed by ANVAR [National Agency for the Valorization of Research], innovative enterprises will be able to benefit from new provisions in three domains: MTI [Medium Term Innovation] loans; PPI [Participational Innovation Loans]; long-term credits. The minister of research and technology announced this important decision on 4 February to become effective on that date.

The MTI is a type of financing in which, on the one hand, a banking establishment advances the funds and, on the other, the CEPME [PME [Small- and Medium-Size Businesses] Equipment Fund] and its subsidiary INODEV [expansion unknown] stand surety for the borrower, so that the banker assumes no risk. For this purpose, INODEV is provided with a Guaranty Fund by the public authorities (65.6 million francs by the state and 12.5 million francs by Regional Public Establishments).

A More Reasonable Price of Money

Since the start of the system--September 1978--the number of loans processed has totaled 386, three-quarters of which by a regional delegation of the CEPME's 20 such delegations. These loans have totaled 237 million francs, 35 percent of which amount has been handled through regionalized procedures. For 45 percent of the sums involved, the credits were opened in 1981.

But an increasingly acute problem has arisen over the past few months owing to the general rise in the price of money. The latter has made access to MTI credit more difficult , since adding the bank interest rate, INODEV and CEPME commissions, and subscription to the INODEV Guaranty Fund often brings the total price to over 20 percent.

The new system that went into effect on 4 February, based on an agreement between the Ministry of Research and that of Finance, represents a considerable forward step. Loans will now be granted at a preset and posted rate: 15.50 percent maximum, all commissions included; that is, innovative businesses will have

the benefit of the lowest available rate in effect on the money market, to which is added only the INODEV-CEPME commission (1.50 percent). The INODEV Guaranty Fund subscription (3 percent) is eliminated; it is replaced by a participation in the capital of INODEV (0.1 percent of the amount of the credit utilized).

Another important new feature is that no real or personal guarantee of any kind is required of the borrowing enterprise. The latter may thus turn to MTI loans for the full funding of an innovational program, obtaining 2- to 10-year loans. The CEPME-covered exposure under these credits, which has been 75 percent, will now be 100 percent.

These MTI credits can be supplemented if necessary either by sectoral incentives instituted by one or more of the technical ministries, or by regional incentives distributed by Regional Public Establishments. A certain number of regions have already begun looking into these new mechanisms: Alsace, Pays de Loire, Midi-Pyrenees, Haute-Normandie, Ile de France, Franche-Comte, Nord-Pas-de-Calais. Going beyond its role as guarantor, INODEV will extend its activities into a new domain, making its services available to businesses to carry out economic viability studies for them. It is in this domain that an innovative enterprise encounters its main problems.

PPI's are frequently linked very closely to MTI credits. The two types of applications are considered together and the procedures for granting them are generally coupled. In effect, when an enterprise undertakes a new innovative action it normally finds it necessary to restructure its finances and to consolidate its own funds. Hence the advantage of this coupling.

The Long Term As Well

The PPI may be considered a loan in the same class with owned funds. Its interest rate is variable in accordance with the results of the enterprise, but may not exceed in any case the loan discount rate plus 2 percent, which currently would be 17.50 percent. Under the new provisions announced by J P Chevenement, the covered exposure under these credits will be 75 percent and the banker will thus be relieved of three-fourths of the risk by INODEV and the PPI guaranty fund. These organizations can also decide, where warranted by minimum-risk files, to take under coverage an even larger portion (85 percent) of the risk, reducing the banker's risk to 15 percent. Thus, a very important new role has devolved upon INODEV, whose capital is to be opened to the entire financial community and whose cooperation with ANVAR is to be strengthened.

Over and above the MTI and PPI sectors, the authorities have also taken steps to improve the long-term credit situation. The government has decided to reserve 1 billion francs for loans at deep-discount rates. These credits will be distributed by specialized establishments under the technical control of the Ministry of Research and Technology. They can be combined with MTI credits and covered by the INODEV Guaranty Fund.

How To Work with INODEV

INODEV, a corporation created in 1978, has as its object the financing of all the needs of enterprises set up to launch inventions industrially and commercially. These financings are provided through banking channels, with INODEV providing the guarantees for the borrowers. This institution has at its disposal, through the CEPME, 20 regional delegations and 7 branch offices. For credits equal to or less than 1 million francs, the procedure is fully regionalized. An MTI credit for a period of 2 to 10 years, frequently coupled with a PPI, covers 70 percent of the expenses, all taxes included, of a program of present innovation. A deferment of capital amortization during initial years is possible. PME's can obtain aid through INODEV in the form of both the financial structuring of its venture and, together with it, an economic and marketing viability study of the innovation involved.

The borrower has a period of 1 year in which to use the credit in one or more instalments.

[Address]: INODEV, 14, rue de Gramont, 75002 Paris. Tel: 261.85.75.

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CSO: 3102/238

SCIENCE POLICY

POST-NATIONALIZATION DEVELOPMENT STRATEGIES OUTLINED

Paris INDUSTRIES & TECHNIQUES in French 10 Mar 82 p 15

[Article by Pierre Michel: "After Nationalizations, Industrial Interlacements"]

[Text] After 7 months of heated debates and two reviews by the Constitutional Council, the nationalization law has now been put into effect. Its implementation translates into the transfer of five of the biggest French industrial groups, 39 banks and two financial enterprises--Paribas and Suez--to the public sector.

The French state finds itself today at the head of a public sector without equal in the Western world, controlling as it now does 80 percent of the credits and deposits of the banking system as a whole, 32 percent of the annual, before-taxes revenues of industry, 23 percent of industry's employees, one-fourth of France's exports and half the industrial sector's research.

Poles of Orientation

The public powers--which have never heretofore so borne out this designation--will now control directly or indirectly (through 50-percent or greater ownership) around 3,500 enterprises, 2,500 of which are headquartered in France.

The nine industrial groups that will now be controlled by the state (USINOR [expansion unknown], SACILOR [Lorraine Steelworks Co], Thomson-Brandt, PUK [Pechiney-Ugine-Kuhlmann Company], CGE [General Electrical Company], Rhone-Poulenc, Saint-Gobain, Dassault, MATRA [Mechanics, Aviation and Traction Company]) represent, according to the Industry Ministry's own figures, a consolidated annual turnover of 150 billion francs (1980 balance sheet) and a total of 750,000 permanent employees.

What industrial strategy will they be required to follow? Initially, it would appear, the government intends to work at "interlacements": It will organize, within various key sectors, vertical and horizontal groupings, integrating everything connected with their activities and of international dimension such as will enable them to face up to (or dialogue with) the biggest and become poles of orientation and development for smaller-sized enterprises.

Five of these interlacements were discussed by Pierre Dreyfus at a recent meeting of ministers:

--Steel: Following the nationalization of SACILOR abd USINOR, a "steel plan" will be set up before the end of the first half of this year. Its objective: To restore to these two groups, within 5 years, a competitivity on the European scale. The nationalization and diversification of downstream activities (metallurgical products) will be defined at the same time. Yet to be worked out in detail, in particular, is the possible expansion of the steelmaking groups into the heavy mechanical, naval construction and tube manufacturing industries. And the fine tuning of a "special steels" program, eliminating redundancies in the industries now connected with USINOR and SACILOR.

--Chemicals: "A victim of the energy crisis and of too wide a dispersion of industrial structures," says the (very vague) communique of the Council of Ministers, "the regroupment and specialization of the activities of this industry around these two or three more powerful groups will facilitate the control of raw materials supplies and of markets." Here again, in fact, it will be necessary to bring order within a branch of industry that has fallen behind these last few years and that involves 300,000 employees. Within its various sectors, therefore, it will be necessary to coordinate strategies relating to the procurement of raw materials, production, and marketing, through a working agreement among Rhone-Poulenc, PCUK [expansion unknown], CDF [French Coal Board] Chimie, Elf Aquitaine...

--Electronics: This interlacement is to be organized--from components to hardware to software--around national groups formed (or to be formed) by Thomson, CGE, CII-HB [expansion unknown], and MATRA, and linked to the Ministry of PTT, the CNET [National Center for Telecommunications Studies]. The objective is to put together a grouping that will be capable of negotiating agreements, on an equal footing, with big foreign firms.

A weak point in this interlacement: components. Unknown factors as of now are the position of Honeywell (47 percent capital ownership in CII-HB) and that of Olivetti, in which Saint-Gobain owns 35 percent of the capital shares.

--Materials: The purpose here is, through PUK, Saint-Gobain and certain branches of CGE, to press forward with research on new materials (fibers, composites, ceramics, super alloys), with the aid of the Ministry of Research and Technology, to make them available especially to the building trade.

--Health industries: There is a need to conjugate the efforts and resources of Rhone-Poulenc and of SANOFI [Financial Combine for Sanitation and Health], a subsidiary of Elf Aquitaine in the domain of bio-industrial and genetic engineering pharmaceuticals. Roussel-UCLAF [expansion unknown] could later join this group if an agreement can be struck with the German group Hoechst.

The state is going to have to inject considerable sums into the different interlacements. The minister of industry, in a recent interview, put at 10 billion francs in 1982, and as much again in 1983, the funds that will be necessary to

Share Held by Public Enterprises of Gross Turnover in Branch

Sector	Percent Before	Percent After
Steelmaking	1	80
Initial transformation of steel	1	58
Metallurgy and initial transformation of nonferrous metals	13	63
Base chemicals	23	54
Artificial textiles	0	75
Transformation of plastic materials	4	15
Fine Chemicals	5	14
Pharmaceuticals	9	28
Glass	0	35
Construction materials and ceramics	1	8
Cardboard	0	9
Foundry	4	22
Metalworking	2	8
Machine tools	6	12
Industrial equipment	3	14
Heavy equipment (materials handling, mining, steelmaking, civil engineering)	0	5
Armaments	58	75
Office automation and data processing	0	36
Electrical equipment	0	26
Household and professional electronic equipment	1	44
Household equipment	0	25
Naval construction	0	17
Aeronautical construction	50	84
All industrial branches	18	32

A public sector without equal in the Western world.

bring order to the financial situation of the five new national enterprises. To this must be added the specific internal needs of the steel industry and those of other public enterprises. And those of other interlacements that are bound to emerge over the next few years.

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CSO: 3102/238

TRANSPORTATION

MBB EXECUTIVES DISCUSS COMPANY'S PLACE IN CIVIL AVIATION

Duesseldorf VDI NACHRICHTEN in German 26 Mar 82 p 26

[Interview with Professor Engineer Gero Madelung, chairman MBB business management, and Dr-Eng Othmar Heise, director, Central Sector for Development: "MBB Puts Its Money on the Creative Engineer-Germany a World Leader in Aviation and Space Technology"]

> [Text] MBB (Messerschmitt-Boelkow-Blohm) is a big aircraft and defense equipment enterprise in Germany and it leads in space technology in Europe. Just exactly where it stands internationally with its know-how,what civilian engineering spinoff derives from its defense equipment development work, what role the MBB engineers play in this process, and what effects the Bonn economy measures are having on the enterprise--these are question complexes which Professor Engineer Gero Madelung, chairman, MBB business management, and Dr-Engr Othmar Heise, director, Central Sector for Development, discussed in a VDI Nachrichten interview in Munich.

VDI NACHRICHTEN: There is talk about war, about military equipment, which is supposed to be the mother of all technology. Is this just a saying or is MBB convinced that this is so?

Madelung: We need not necessarily have to trouble history to document the real nucleus of this idea. The Boeing 707, for example, sprang from the American military transport aircraft program. And the American space program, which likewise has a military origin, gave TV satellites to all the world. Yes, the saying even applies to technical developments in present-day Japan.

VDI NACHRICHTEN: How do you explain that?

Madelung: In defense technology, the important thing is to find a technical response to the anticipated technical efforts of a potential military opponent. That can be even more existential than the toughest competition fight in economic life--and this most quickly leads to top-level achievements in the light of past experience.

VDI NACHRICHTEN: MBB achieved its top results likewise in defense technology development. What was the share of government orders here?

Heise: Military equipment accounts for DM3 billion, in other words, 60 percent of our sales volume in 1981, about DM4.7 billion. Defense ministry orders thus play an important role in the enterprise, particularly also in the research and development sector. In 1981, our contract research volume was DM350 million. To that you have to add DM250 million in conditionally repayable subsidies. On top of that, MBB during that same year also spent DM120 million for "free," in other words, in-house-financed research and development. The BMFT [Federal Ministry of Research and Technology] share out of the business volume comes to about 3 percent, that is, 3 percent in the "very high-technology" items. The sum from in-house-financed and loan-based research funds totals about 8 percent. In percentage terms, we can be compared here to enterprises such as Boeing or Siemens.

Free Development Being Boosted

VDI NACHRICHTEN: What does it mean for MBB development activities when Bonn is now also starting to cut defense expenditures?

Madelung: Less contract-based development. But to keep up, we must behave in an anticyclic manner and we must boost free development. This year, we are going to spend DM175 million for free research and development. We must get through this dry spell, we must not tear development teams apart, and we must keep our product line conpetitive.

VDI NACHRICHTEN: What would be the consequences of a longer-lasting Bonn savings drive concerning arms orders?

Heise: The important thing is to prevent a renewed decline in the German aviation and space industry to the level of a licensee or subcontractor. Progress in European integration in this sector of industry and administration would be in doubt. The natural knowhow transfer from military to civilian projects would be reduced, with the result that the civilian sector would likewise find its technological capacity weakened.

VDI NACHRICHTEN: This knowhow is being developed by about 6,000 engineers working for MBB. Dr Heise, our readers are certainly interested in what specialized fields are represented here.

Heise: The machine-builders are represented most frequently and aircraft builders and engineers working on measurement and control instruments dominate among them. Next we have the electrical engineers, above all from microelectronics and information science. Including natural scientists, we have something like 4,000 engineers on the B.S. level, the others have master's degrees and PhD's. Some of those 6,000 are, so to speak, the "critical mass," in other words, the necessary minimum to be able to engage in meaningful development to begin with. For the development of a combat aircraft, this "critical mass" is about 600 engineers.

VDI NACHRICHTEN: Is MBB also pursuing pure basic research?

Heise: Probably less than 1 percent of the total R&D force. As an example we might mention aerodynamics here; we are working here among other things on the fundamental but technically extremely interesting problem of the separation of air flow along the wings.

VDI NACHRICHTEN: In what specialized fields do you have your strong points?

Heise: Certainly in fiber technology. MBB here did trail-blazing work with the glass-fiber sandwich material for helicopter rotors and the broad use of this technology in aircraft construction today can be compared only to the transition from canvas skin to light-metal skin. Quite obviously, we are very much concerned here with aerodynamics, quality testing, and nondestructive materials testing plus the glueing of metals, operations research methods, the development of acoustic and optical sensors, as well as system engineering and measurement and control engineering which run through all of our activities like a connecting thread.

Switching From Team to Team

VDI NACHRICHTEN: What is the management principle which MBB uses in this "think tank?"

Heise: We are working by teams which give the individual staff member the feeling of more freedom than in a strict hierarchy. This is indispensable for creative processes. Changing from team to team is possible and also desirable. The average size of the team is between 10 and 40 people. Teamwork motivates enterprise-oriented thinking. Early this year, Professor Madelung urged the staff members to emphasize this aspect even more.

Madelung: By the term "enterprise-oriented engineer" we mean the creative engineer, we are talking about the man who achieves creative results with a certain degree of discipline. Discipline here means that the desire to create must remain within the limits of that which is economically feasible. Beyond that, discipline and cost-oriented thinking are not only requirements but also "stimuli" for creative brains.

VDI NACHRICHTEN: And is MBB successful in this?

Heise: Through this philosophy, MBB managed to catch up internationally already during the 1960s in spite of the forced break in our development work after the war. The result is quire respectable. Today we are working on about 20 major international projects and around 200 minor ones. An even larger number of study titles is in a preliminary phase and is, so to speak, ready for transition to a project-oriented development effort. Besides, our record of patents is definitely positive.

VDI NACHRICHTEN: We are quite familiar with the MBB defense showpieces, such as Tornado, AT rockets, or attack helicopters. What about the civilian engineering utilization of this defense creativity?

Madelung: As a result of the merger with VFW [United Aeronautical Works], we were able to expand our civilian engineering activities. We used military technology in the Airbus. This is the most recent example showing the first-time use of the digital autopilot, based on a feature of the Tornado, as used in a civilian aircraft. Our helicopters went into series production first for the civilian versions and military components development were included in that program. We are now also using fiber technology employed in helicopter rotors for the single-blade rotor of the Monopteros wind energy converter. The light-structure knowhow derived from aircraft engineering again is expressed in MBB freight car construction and the knowhow in measurement and control equipment engineering for example is expressed in the motor for heliostats used in solar power plants.

VDI NACHRICHTEN: Just exactly how large is the civilian share of MBB output?

Madelung: At this time it is around 40 percent but there is a rising trend here. An expansion is conceivable above all in the areas of rotary wings and big aircraft as well as energy and transportation equipment.

VDI NACHRICHTEN: Where does MBB stand as aircraft builder in technical terms in the context of an international comparison?

Madelung: We cannot offer the broad spectrum of the United States competition but in engineering terms we are quite far forward with transport aircraft, rotary-wing aircraft, combat aircraft, smaller missiles, and in satellite technology. Our Augsburg plant, where we make the Tornado, is the world's most modern aircraft factory with its automatic production line. It turned out on the world market for aircraft that the manufacturer is expected to offer aircraft families. This is something we have to keep in mind in the Airbus if we want to continue to remain competitive.

VDI NACHRICHTEN: What about technology transfer at MBB in general?

Madelung: The control equipment used in Augsburg naturally also benefited the suppliers of these machine tools. Something similar applies, for example, to our titanium technology. As everywhere else, the subcontractors benefit from our knowhow also in our case. Looking at a combat aircraft, 65 percent of the volume at any rate are awarded to the outside.

VDI NACHRICHTEN: Is MBB advocating government research subsidies?

Madelung: In key areas, absolutely. The areas which are being promoted in Japan and the United States must also be promoted in West Germany. The big American manufacturers, for example, share in strategic armament funds--which are not being used in West Germany--when it comes to aircraft development.

VDI NACHRICHTEN: What about cooperation with large-scale government research installations, such as, for example, the DFVLR [German Research and Development Institute for Air and Space Travel]?

Madelung: We are cooperating, for example, in those fields where we have a common client and that as a rule is the government. The DFVLR moreover has facilities, such as wind tunnels, for example, which we can also use. We are not as strong in terms of capital as our competitors who can afford having their own big wind tunnels.

International Cooperation

VDI NACHRICHTEN: What about international cooperation?

Madelung: That already springs from the fact that all of our big projects are after all international. Moreover, there is for example also an exchange of knowhow within the NATO context.

VDI NACHRICHTEN: With 2,200 staff members active in this field, MBB is one of the biggest enterprises in Europe in space technology. Do you believe that the civilian sector of space technology has a future?

Madelung: Getting into the commercial satellite business is worthwhile but it is also difficult essentially since the pertinent industry in the United States has big military contracts and produces satellites in series. So far we are only making individual copies.

Heise: The only exception is "Intelsat V" for which we presently have orders for 11 structural components, with options on five. At any rate, since we are a non-American company, we did get a contract for a payload for the Space Shuttle, that is, the Spas [space] Platform.

VDI NACHRICHTEN: How important is "Ariane" for the European space industry?

Madelung: Without our own European launch possibility for big commercial satellites, we would have no chance for our satellite production. This is why the rocket is being boosted successively for higher payloads.

VDI NACHRICHTEN: Your statements again and again contain the observation that, in other countries, the government order base via military expenditures for enterprises of the size of MBB is broader than in the FRG. Is this supposed to be a gentle reproach?

Madelung: The space sector in the FRG is purely civilian. Because our neighbors France and Great Britain have a military component here likewise, we believe that we are facing competitive disadvantages which we seek to balance out through our own free research funds.

VDI NACHRICHTEN: Are the Europeans planning reusable space vehicles?

Madelung: The competitive capability of the Europeans as against the United States must be increased. This means that we must be able to offer reusable systems. Our space platform is a beginning here. Perhaps other concepts--assuming money is available--will someday become reality, as you reported in your issue of October 1981.

VDI NACHRICHTEN: How can MBB assert itself in the future in a continuing public economizing climate?

Madelung: We did of course become known as a think tank but we are primarily an economic enterprise and we therefore must behave on the market like any other industrial firm. We cannot live on dreams for the future. That also means that we must rationalize. For example, we are investing to make our production of Airbus parts even more efficient. Our immediate goal is to turn out eight aircraft per month. If the business volume should stagnate, MBB furthermore will probably not be able to avoid reducing the total workforce of 40,000 by about 4,000 jobs over the next 4 years; here of course we want to make use of natural attrition to the extent possible. The age structure will be a problem. Today I can only point out that the integration of VFW into the enterprise is taking place more smoothly than we had anticipated. The organizational merger with VFW into product-oriented enterprise divisions has been completed.

VDI NACHRICHTEN: A concentration of resources can be observed internationally in your branch and in others. Is MBB--which after all combines all German aircraft engineering firms with just one exception--planning further mergers?

Madelung: We must expand in order to be able to keep up in this technically and economically hard-fought market. Larger aircraft and space technology units would be desirable in Europe but the national viewpoint is opposed by sovereignty viewpoints which, as we learned from the VFW-Focker experiment, play an enormous role. Times do not yet seem to be ripe for such mergers. In case of future necessary mergers of MBB, the boundaries of the FRG will probably not yet be crossed.

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CSO: 3102/254

FIBER OPTICS USED TO CHECK FOR AIRCRAFT STRUCTURAL CRACKS

Stuttgart FLUG REVUE in German Apr 82 p 62

[Text] In order to detect cracks in metals and laminated fiber structures, technicians used very fine wires or conductive paints which were applied to samples or long-term test pieces. If the material cracked, the circuit was interrupted. The method has errors and is subject to disruptive influences. A new system using light conducting fibers as a crack sensor, which perform the same task much more precisely, has been developed at VFW [Consolidated Aircraft Works].

Light conducting fibers that can be used for this purpose are between 30 and 100 micrometers thick. They consist of a glass core and sheath of different optical density. Through the overall reflection, characteristics of optical transmission are created which can transport light over considerable distances (about 10 to 20 meters for this application). The individual fibers are bonded so firmly to the aluminum with a two-component zinc-chromate primer that the tiniest hairline cracks in the metal structure are transmitted directly to the light conducting fibers. At the smallest break in a fiber, the "light flow" is interrupted. Test pieces are exposed to a beam of light. As long there is no crack present, the light is transported undisturbed. A 1-watt light bulb, or alternatively a photodiode with a circuit booster behind it, serves as transmitter and receiver. Through a more complex method of light input from LEDs, semiconductor lasers or flash lights, the detection possibilities can be improved.

For broader application, the team in Bremen has developed a procedure which allows rapid application of the light conducting fibers by means of a special film. Using this procedure, it will be possible to examine even extremely complicated structures in crack-prone areas.

The researchers in Bremen believe that, in addition to the many areas of application in vehicle and container construction, in subways, cranes, bridges and nuclear reactors, it is principally air and space travel that will derive considerable benefit from this development. Expensive total inspections, which frequently require total dipping of cell structures before X-ray and ultrasonic inspections are conducted, are rendered superfluous. The crack sensor can be activated at any time as a silent spy. The first application: Structural components in the fuselage of the A 310 Airbus.

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CSO: 3102/234

FRG PLANS TO PLACE MORE EMPHASIS ON WHEEL-ON-RAIL R&D

Duesseldorf VDI NACHRICHTEN in German 26 Mar 82 p 2

[Article by Ralf Roman Rossberg: "Wheel-Rail Research To Be Further Promoted--Balance With Magnetic Transportation Engineering--Emphasis Initially on Tests and Experiments"]

> [Text] The BMFT (Federal Ministry of Research and Technology) is presently promoting mostly the magnetic suspension technology in the field of track-bound long-distance express travel which is definitely borne out by the Transrapid experimental facility in Emsland. The ministry nevertheless does have the intention as soon as possible again to pay more attention to wheel-on-rail research. The objective is still to return to an evenly balanced promotion of both of these most important railroad engineering development lines, that is, wheel-on-railand magnetic movement technology and thus to establish equal opportunity between both lines for a necessary system comparison.

Research promotion presently is concentrated in the wheel-on-rail sector on the development and construction of an experimental and demonstration train which is to consist of two motor coaches with, initially, two cars in the middle and which could be considered as a forerunner of a new generation of fast rail vehicles. The trouble spot here however is the financing question. The BMFT views "essential participation by industry and the German Federal Railroad to be indispensable not only for financial reasons." The Federal Railroad however feels that research promotion could not do justice to its immediate enterprise objectives, particularly in view of the extremely critical financial situation. The BMFT however wants to supply only 50 percent from its funds; the other half is supposed to be contributed by industry and the Federal Railroad.

By order of the Transportation Committee of the German Federal Railroad, it has in the meantime been investigated whether and where there are suitable testing possibilities or whether or where such possibilities could be created on short notice in the line network of the Federal Railroad for this kind of experimental and demonstration train. Accordingly, trial runs can be made at up to 250 km/hr

--with some restrictions--on the existing Rheda--Oelde line segment in Westphalia and at even lower speeds possibly also on other segments. But it is especially the upper speed range of up to 300 km/hr which is considered to be decisive for future developments here. This is why the Federal Railroad and industry are urgently waiting for a suitable experimental facility outside the railroad operating network. The Rheine--Freren section of the old Oberhausen --Rheine--Wilhelmshaven line has been earmarked for this purpose; it is needed for freight transportation only to a minor extent; because of its more than approximately 23 km of completely straight line layout, it seems well suited as test line and some segments have already been prepared for this purpose.

The DM108 million already approved for the development of the experimental facility however were again deleted by the BMFT in view of the budget situation in the autumn of 1980. This promotion effort now is supposed to complete for the time being at least the plan determination procedure in order to keep an option open for the selection of this line segment in medium-range terms. It is expected that the wheel-on-rail experimental track can be improved as soon as the first construction phase of the Emsland magnetic suspension experimental facility has been completed, presumably in 1983.

In the meantime, wheel-on-rail experiments are being concentrated at the test stand. The rolling test stand, erected in Munich-Freimann, is being promoted with BMFT funds. It is to be used increasingly for experiments with up to four axles and simulated speeds of up to 500 km/hr. A complete rail vehicle will be placed on the test stand for the first time now, after investigations so far had been confined to individual axles and trucks. Theory and practice produce good agreement during the start-up phase of this comprehensive experimental facility in the light of what we can judge so far. The BMFT therefore believes that there are suitable possibilities here for continuing this effort until the "equal opportunity" which has been promised can be achieved and until the Rheine-Freren wheel-on-rail experimental facility can be completed.

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CSO: 3102/254 END

JPRS 80957

2 June 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 105

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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FERRANTI INTRODUCES CAD SYSTEM FOR GATE ARRAYS

Wuerzburg ELEKTRONIKPRAXIS in German Feb 82 p 54

[Text] For its 10th anniversary, Ferranti is introducing an interactive computer-assisted design system for gate arrays, with which LSI [Large-Scale Integration] and VLSI [Very Large-Scale Integration] Uncommitted Logic Arrays (ULA) can be designed, specified and verified.

"Just a few years ago, the number of gates that were integrated into complex circuits was about 300, today it is already 2,000, and soon it will be 4,000 or 6,000." Juergen Rymus, IC marketing manager at Ferranti, offers this for consideration and he thinks that automation is necessary here. The solution for Ferranti is the ULA designer: An automatic development aid which could utilize equally the technical circuit expertise of the user and Ferrant's experience in array technology. In practice, this means that the user completes the entire ULA design phase inside his own four walls with the appropriate technical aids and the verification is carried out by outside specialists. In this way the developer ensures protection for his design.

"The ULA designer is designed for gate arrays with complexities of from 100 to more than 10,000 gates," explained Rymus and added that the annual capacity is set for 40 ULAs with a complexity of 1,000 gates. In the basic version, the ULA designer consists of a PDP 11/23, a graphics screen unit with a keyboard, a digitalizing board, a control desk and an optional plotter.

Ample Software Package

The designer software, backed up by the multiuser and multitask RSX-11M operating system, is composed of the ULA library, the layout, the logic description, the test specification and the transfer process.

The library contains all the necessary information for the design and verification of individual ULA versions. The layout program contains the layout input, the machine drawing and the editing.

An overall check of the test plan is possible as part of the test programs. During the transfer of the data packages from the ULA designer to the CAD center, the system generates check lists to verify that all the information is being transferred with the data packages.

Currently there are already 50 variations of the ULA, but the application software is constantly being expanded.

Over the Telephone into the CAD Center

The software and hardware components mentioned so far together represent the user system configuration. An additional important component of the total system, in which Ferranti's knowhow in array technology has been demonstrated, is the ULA host computer. The ULA designer can communicate over an ordinary telephone line with the host computer in the CAD center in Manchester (England) or Sunnyvale (California).

In Four Steps to the Finished Design

The input of the logic plan is the start of the design process. The second step is the design of the ULA layout, with the help of standard functions and of functional units developed by the user himself. Interactive editing of all errors or changes in the control drawings plotted by the computer can be carried out at the screen terminal. This is followed by the input of the test specification, which is used both for logic verification and for generating the ATE [Automatic Test Equipment]. The fourth and final step is verification of the design. For this, the user transmits the three major blocks, logic, layout and test information, to the host computer, together with sets of commands for logic simulation, layout check and setting up the test program.

Once the design phase is complete, the user can begin the manufacture of masks and prototypes. "And in 3 to 4 weeks after presentation of the logic plan and the layout, the ULA prototypes are available," is Juergen Rymus' answer to the question about the time required.

If the ULA designer is not needed for designs, it can also work as a minicomputer for a laboratory or an office. Compiler and Fortran, Macro and Cobol are available, supported by a text editor and various program libraries.

Code: 417

9581
CSO: 3102/261

ICI DEVELOPS MORE READABLE LIQUID CRYSTAL DISPLAY

Essen ELEKTRONIK-APPLIKATION in German Mar 82 pp 11, 12

[Text] ICI has made a significant improvement in the readability of liquid crystal displays (LCDs) with the development of coloring agents of greater purity for the British Royal Signal and Radar Establishment (RSRE). The colored background now possible increases the contrast and makes superfluous polarizers which limit the viewing angle of conventional LCDs. The results of the work in the ICI laboratories in Manchester will have a significant impact on all forms of electronic visual displays and will probably have special significance for automobile and aircraft instruments.

This form of display is based on the alignment of long chain molecules in an electrical field. A variation in the applied field causes a change in the reflectivity of the liquid. Most passive displays are based on this effect. The special attraction of LCDs is their small energy consumption compared to alternative systems.

A significant deficiency of LCDs is that they have to be viewed almost perpendicularly: From any other angle, they are unreadable. This is due to polarization effects which result from maximizing contrast. Color is seen here as a possible way to circumvent the problem. ICI found a new pigment formula which is specially tailored for coloring LCDs. Success depends on skillful manipulation of the chemical properties of the pigment molecules. Once the pigment is mixed with the liquid crystals, the individual rod-like pigment molecules can be made to rotate throug 90 and to align themselves whereupon they absorb light and become colored. The rods make a polarizer superfluous and thus give a 50 percent greater light intensity. A white display on a colored background formed with these pigments can be read in subdued light and from various angles. The contrast is snarper than that provided by any other process available to date.

9160
CSO: 3102/246

EUROTECHNIQUE MORE SUCCESSFUL THAN PREDICTED

Paris ELECTRONIQUE ACTUALITES in French 5 Mar 82 p 11

[Article by J.P.D.M.: "10 Million CI MOS at Eurotechnique in 1982"]

[Text] Eurotechnique (51 percent Saint-Gobain; 49 percent NS (National Semiconductor)), one of the three foremost MOS/C-MOS integrated circuit semiconductor companies, should produce over 10 million MOS integrated circuits this year, thus exceeding its delivery schedule. Production in 1981 had already reached 2.5 million integrated circuits (essentially during the second half of the year) and had been higher than predicted, this being in any case largely a matter of compensating, through processing volume, for the poor current economic picture and low market prices.

Eurotechnique does not hide the fact that its losses exceeded company projections for 1981 and that profitability for the operation is no longer expected before 1984 (1983 was the forecast in the development plan). However, the company has no turnover figure, its results being consolidated with those of Saint-Gobain. Actually, although company executives are not commenting on the matter, the fate of Eurotechnique, which is 51 percent nationalized Saint-Gobain, is in the hands of the government. Unofficial government plans include separating Saint-Gobain's electronics activities. But will Eurotechnique become part of a holding company combining CII-HB, Olivetti shares, R2E, and Logabax? Will links be established with Thomson (something which Eurotechnique does not seem to want?)

Sixty-five Percent of Turnover for Exportation

Be that as it may, Eurotechnique's goals for 1981 were met, in technical terms. The Rousset center now employs 400 people and its production rate has reached 12,000 4-inch wafters per month. The company relies exclusively on a 3-micron technology comparable to HMOS-1, and since the third quarter of 1981 has been obtaining production yields comparable in order of magnitude to results at the NS plant in the United States. The company claims that its quality control standards match those of its Japanese competitors: less than 500 defective parts per million parts delivered. The exportation goal was also met: 65 percent of deliveries were made abroad in 1981, directly for a large order and through the distribution channels of Germany and England; a sales office has also just opened in San Francisco.

Where products are concerned, the first phase which consisted of establishing a production unit with standard circuits is now complete. Currently in production are the 16K-bits 4116 dynamic memory, the 4K-bits 2147 static memory including the 2147 H/35 ns, the EPROM 2716 and 2732, the 8-bits 8050 microprocessor, and the 4-bits COP 420 with 1K ROM microprocessor.

Eurotechnique must now cross the difficult 1982 threshold when very large scale mass production will be a fact of life while the world economic picture will probably remain poor. For a company with no resales of imported products and subsisting only from its own manufacturing, the strength of the sales network is a fundamental parameter. The company currently has a network of eight distributors in France and will expand during 1982 in 13 countries (four distributors in the United States, two offices and three distributors in Germany, one distributor in Italy, Switzerland, Israel, and Spain, two distributors in Scandinavia and the Benelux countries.) The company thus hopes to retain a turnover percentage of at least 60 percent in exportation. This year, conformity with IBM and Olivetti should follow the already-established conformity with CNET (National Center for Telecommunications Studies) and CII-HB.

Striving for a Coherent Product Line

The company's second goal for 1982 is to offer a coherent line of products. This year, the following N-MOS items will be available: ROM 42716 (16K), 42732 (32K) and 42764 (64K), and EPROM 2764 (64K); at the end of 1982, the 4164 (64K) dynamic RAM and the 2128 (2K x 8) static RAM will also be in production, as will the COP 410/444 and 2440 microprocessors, and the 8048 and 8049. At the end of the year, the NS 800 C-MOS (Eurotechnique's ETC 800) should also be introduced as well as the 16-bits 16032 microprocessor (the NS 800 is compatible with Z 80). Finally, in 1982, the following will appear in the field of telecommunications C-MOS circuits: COFIDEC 5051/5056/5054/5047; a controller; CODEC 5020/5021/5156A; the 5040 filter, and the 5310 modem. At the same time, beginning with the Salon, a European-formula family of cards based on the Z 80 will be marketed, which we will discuss again in the future. For the most advanced circuits, Eurotechnique will turn to MOS and C-MOS 2-micron technology (the company's first wafer stepper was installed early in 1982).

Five Development Strategies

But the company must also prepare for the future, and in particular must design its own family of circuits which will play an important part in Eurotechnique's catalog for 1985 when the present (renewable) second source contract with NS expires.

A fledgling company like Eurotechnique cannot possibly have a no-holds-barred new products policy. Thus only six strategies have been selected: EPROM memories (the 64K-bits, planned for the end of 1982, will have been designed by the company); EEPROM memories (a two and one-half year program has been formulated for large capabilities; these memories should eventually replace EPROM in 50 percent of applications); specialized microprocessors; telecom

circuits (COFIDEC under contract with DAII, whose first chips are now being tested jointly with NS; T83 circuits; and terminal circuits); N-MOS/C-MOS cards and systems; and finally, pre-diffused C-MOS with two levels of metallization and large capacity, which should go into service late in 1982. This year, Eurotechnique will devote 18 MF to its research and development. (Until now, the creation of Eurotechnique has represented an investment of 200 MF). Jean-Luc Grand-Clement, general director of Eurotechnique, admits that the importance of the company at this point does not allow self-financing for all the research that would be desirable, but he emphasizes that MHS and EFCIS are in the same position and that cooperative research among French semiconductor companies would be in everyone's interest.

11,023
CSO: 3102/206

BRIEFS

THOMSON-CSF 'SPACE' DIVISION--Paris--Thomson-CSF activities in satellite-mounted electronic equipment and systems have reached such proportions that the company has decided to create a Space Division, it was announced in a communique issued on 17 February. The new division, the communique indicates, is responsible for satellite-mounted equipment, for complete payloads, and for space systems which include a satellite. Division headquarters are at Courbevoie and plants headquarters in Velizy. A new center will open in Toulouse in 1983 with 600 employees. Thomson-CSF will then have a modern industrial facility, "practicqlly unique in Europe," for the design, implementation, and integration of payloads for communications, broadcast, and observation satellites. Thomson-CSF will participate "significantly" in the INTELSAT-VI satellite, the largest contract in the history of commercial satellites with its cost of one billion dollars, and which will represent two-thirds of world telecommunications during the next decade. The group will also be general contractor for the TELECOM-1 payloads; this satellite will offer, in 1983, new telematics services to enterprises, representing an order of 300 million francs, while military applications will account for 500 million francs. In addition, the division will provide much of the equipment for the French-German television satellite launched by Ariane in 1985. Thomson-CSF Espace, which will have a 400 million franc turnover this year, employs 600 people and expects to reach 1000 in 1985. [Text] [Paris AFP SCIENCES in French 18 Feb 82 pp 21-22] 11,023

PHILIPS, SIGNETICS, RCA JOINT CMOS--Philips, Signetics and RCA have signed a design and development agreement concerning joint development of a new family of high-speed CMOS circuits whereby each company will supply the same set of approximately 180 circuits. Presently, most electronic data processing installations are built around low-power Schottky chips. The new high-speed CMOS logic will be just as fast as Schottky logic but will require only 1/1000 the power. In addition, CMOS chips are less sensitive to interference so that the potential for errors is reduced. It is estimated that the worldwide market for high-speed CMOS circuits will amount to about 500 million dollars by the mid 1980's. The new circuits will probably be available in the second half of 1982. The agreement includes common development rules and the exchange of tapes for computer-based mask production so that the interchangeability of the high-speed CMOS products is assured. [Text] [Essen ELEKTRONIK-APPLIKATION in German Mar 82 p 13] 9160

CSO: 3102/246

COAL-WATER FUEL TESTED IN SWEDISH DISTRICT HEATING PLANT

Stockholm NY TEKNIK in Swedish 8 Apr 82 p 2

[Article by Hans Werner]

[Text] Upplands Vasby will be the first municipality to test coal-water fuel.

A 25 MW central boiler plant will be driven by coal powder mixed with water during a year-long test.

Negotiations are underway between Nycol and the municipality of Upplands Vasby north of Stockholm. The anticipated result is that a shut-down boiler plant will be used to test the coal-water fuel.

A total of six municipalities are involved in discussions with Nycol concerning the field test. Tests will be conducted only if the Board for Energy Production Research (NE) provides economic support to the municipalities for the tests.

"Mutual interest has been expressed for such cooperation between Nycol and Upplands Vasby," municipal commissioner Jimmy Bjork said. He believes that negotiations may be complete after Easter.

Shut-Down Reserve Boiler

The reason that Upplands Vasby is interested is that the municipality has a 23 MW boiler that has been shut down. It is an extra reserve facility for the municipality's new district heating system which began operating 5 years ago.

"We are also favorably located geographically with respect to Nycol's Sodertorn plant," Jimmy Bjork said.

The test is expected to cost about 2 million kronor, although this will not be paid by the municipality. Too little is known at present about how much reconstruction will be needed at the boiler plant, how much flue-gas purification will be required, and how high fuel costs will be.

The full-scale tests will also reveal the efficiency of such a plant. These questions can be answered only after the test period of about 9 to 12 months.

Whether this project is successful or not, Upplands Vasby eventually must turn to something besides the convenient but expensive oil now used. If the coal-water fuel fulfils all its expectations, it could be the desired alternative.

Heat Pump Plant Studied

Along with these negotiations, the municipality also is studying the possibility of investing in a heat pump plant. The idea is to remove heat from the water of Lake Malaren for the district heating network.

It is estimated that such a station with two heat pumps producing a total of 20 MW would cost between 50 and 60 million kronor. This may be compared to a single new boiler for solid fuel with a power output of 35 MW which today costs 40 million kronor.

Regardless of which alternative to oil is chosen, large investments will be needed. For this reason, low energy costs will be a prerequisite if the alternative is to be economically justifiable for the municipality.

Coal Economical

This municipality's recent status report on energy discusses all possible alternatives. The conclusion is that heat pumps and coal are the best alternatives to oil today.

One conclusion was that if the municipality were forced today to replace oil in its district heating system, which will purchase 14,000 m^3 oil this year, convention coal firing is the only economically feasible alternative.

Another aspect of energy planning in this municipality is that a new electric boiler was purchased last March for the municipal power plant. This was also done to reduce the amount spent on oil. The 12 MW electric boiler makes it possible to utilize inexpensive electricity.

9336
CSO: 3102/269

STUDY SHOWS COAL LIQUEFACTION STILL NOT ECONOMICAL IN FRG

Duesseldorf VDI NACHRICHTEN in German 19 Mar 82 p 5

[Article by Hans Overberg: "Liquefaction of Coal Still a Dream"]

[Text] At the present time and for the foreseeable future, the liquefaction of coal is not economically feasible in Germany. This assessment applies to both German and imported coal. Although a combined coal/residue conversion (residue = topped crude from the refinery) markedly improves the result, it does not decisively affect this outcome. These are the most important key statements made in the study done by Veba Oel AG, Gelsenkirchen, which was elaborated by this firm for the Federal Ministry for Research and Technology. The study extends to a total of 20 volumes.

Hard coal and extra-heavy oil (residue) were considered as input material for the investigated system, with the design being based on a self-sufficiency plan--namely, that gasoline and fuel oil are produced as finished products suited to real market conditions. This plan designated that two of the total of four hydrogenation legs should be capable of being operated with either coal or residue. Designing the integrated plant for the alternative employment of coal and extra-heavy oil has turned out to be impractical, reports Veba Oel, because in that case the plant would have to be provided with about 11 million t/a [tons/year] of refinery residue. But the amounts of products resulting from this (about 8 million t/a) which would have to be further processed externally could not be introduced in nearby refineries without costly renovation measures.

The planning and construction time for such a plant--operating according to the Bergius-Pier process as further developed by Veba Oel into the Veba-Combi Cracking system--would require 8 years and would necessitate about DM 6 billion (1981 price level) of fixed investments. During the construction phase another DM 1.7 billion in taxes and interest would be added, so that the total capital on which interest is paid would come to DM 7.7 billion. This initial cost supposedly includes environmental-protection measures and start-up costs also. The study says that given an inflation rate of 6 percent per year, the total investment increases to DM 9 billion and the total capital on which interest is paid increases to DM 11 billion. It says that 3,000 employees would be needed for the operation of the entire plant, and of these 1,550 would be on the production end.

Probably the most serious matter is the unprofitability associated with a coal hydrogenation process. That is, according to the study an annual subsidy

requirement would arise of DM 1.4 billion if German coal is used. Leaving public assistance out of account, the cost-covering price at the gas pump for gasoline would be 2.20 DM/liter, with a concurrent fuel-oil price of 1.61 DM/l. The study says that if imported coal is used, the annual subsidy requirement decreases to about DM 1.1 billion, the price for gasoline goes down to 2.05 DM/l, and the price for fuel oil goes down to 1.45 DM/l. If two process legs were supplied with extra-heavy oil or residual oil, the annual under-covering of costs would be reduced to DM 0.9 billion with the use of German coal and to DM 0.8 billion in the case of imported coal. If the sole production is that of gasoline from German coal, the subsidy requirement increases to 1.5 billion DM/a, and the gasoline price then amounts to 2.37 DM/liter, inclusive of all taxes and sales expenses.

According to the study, although after a certain period of time positive operating results can be expected, one cannot expect any positive overall balances. It is shown by calculation that with a 7-percent price rise for the input materials and for the fabricated products, when German coal is used no positive operating results are achieved as yet even after 20 years. In the most favorable case--that is, with the use of imported coal and residual oils--positive results are feasible after 7 years, or in other words not until in the eighth year. Assuming a price rise of 7 percent for coal and 8 percent for the products, the study say that with German coal positive operating results are not conceivable until in the 14th year, and with imported coal and residual oil not until in the sixth year of operation. In the case where German coal and topped crude are used, it is true that the receipts would cover the production costs in the seventh year, but the operating losses of DM 6.4 billion accruing by then would remain uncompensated. Only if there are very high returns on the capital in later years could positive interest yields arise, it is said vaguely.

The firm deals exhaustively with possible sites in the FRG, above all in connection with the size and availability of the property, with infrastructure, the environmental situation, political acceptance, and site-specific costs. According to this study, the site of Rheinberg on the left bank of the Lower Rhine would be the most suitable. Even allowing for the handicaps associated with sulfur dioxide and fine dust as well as the noise-control situation, such a large plant is realizable there, the study says, but political acceptance for this site is lacking at present, because the population and the political bodies have refused this. Also rated as favorable for coal hydrogenation is the site of Brunsbuettel on the Lower Elbe, since here only the noise-control measures would require large investments, and only the disposal of effluents would bring particular problems. The investigated site of Dortmund-Ellinghausen (Hoesch property) is practically out of the question because of the poor connections with the transport network (canal). Also unsuitable would be Emden or Luneplate on the Lower Weser.

On the other hand, it seems possible to achieve environmental protection for a large-scale hydrogenation system. For the gaseous and dustlike emissions, the standards based on TA [technical guidelines]-air would not be exceeded. According to the study, the following can be estimated as maximum values from such a plant: SO_2 about 750 kg/h, for NO_x 800 kg/h, for CO about 220 kg/h, for hydrocarbons 300 kg/h, and for dust 140 kg/h. Satisfactory SO_2 values would be achieved if all the furnaces were fired with almost sulfur-free C_1/C_2 gases. The sulfur brought into the hydrogenation plant via the coal and residue is converted into H_2S, and

more than 99 percent of it is changed into elemental sulfur in Claus sytems which have an added-on Scott stage. The study says that the most difficult problem is presented by the noise emissions. It would be possible to adhere to the prescribed limits of the TA-noise only through special protective measures which go far beyond the present state of the art. The paramount consideration above all, says the study, is the distance of the plant from residential areas which are located in the vicinity.

According to the study, after recovery of phenols and ammonia the process water is subjected to a multistage purification process. The quality of the effluent prior to emptying into the drainage canal would correspond to the legal feed-in conditions, the study says. After concentration and centrifuging, the sludge which has accumulated in the effluent-purification process is incinerated in sequential fluidized-bed furnaces. The waste products one would obtain would be primarily solids from the gasification of the hydrogenation residues--consisting of the coal cinders introduced into the process and the one-way catalyst. These solids would be fused by the gasification at 1300°C to 1400°C and would be changed into a vitreous consistency through quenching in a water bath. The granular material thus produced--amounting to between 240,000 t/a and 580,000 t/a, depending on the mode of operation--would have a non-porous surface, and upon being dumped would be neutral with respect to affecting the groundwater.

In summary, the upshot is that an industrial-scale coal hydrogenation is said to require a relatively large area and good connections with respect to transport, so that only a few sites in the FRG would be eligible at all for this purpose. Moreover, the study says that it must be anticipated that the population will have a negative attitude toward it everywhere. There are no major technical problems, although with respect to the further development and optimization of the process some unsettled questions still need to be answered. In the fields of residue treatment and reaction-chamber design, more developmental work has to be done--namely, with respect to a higher specific reactor fuel charge and a higher product yield--so as to achieve a better economic efficiency. The study says that although it is not disputed that such a large-scale plant would bring benefits to German industry as a reference facility, its poor economic efficiency today and in the foreseeable future is the decisive criterion. But in any case, the indicated capital expenditures and operating losses would go beyond the means of a private-sector enterprise.

12114
CSO: 3102/249

BRIEFS

WORLD'S LARGEST BIOGAS PLANT--The world's biggest plant for the production of biogas from material of vegetable and animal origin has become operational at Ismaning near Munich. The plant was built by the engineering and aerospace company Messerschmitt-Boelkow-Blohm with a financial contribution of DM2.5 billion from the Federal Ministry of Research and Technology. The plant will process manure coming from 1,000 head of cattle plus vegetable waste coming from nearby factories. The plant's output capacity will be 4,000-5,000 cubic meters of biogas per day. The gas will be used to generate energy which will supply the local electric power grid. The transformation of gas into methanol, as a fuel for transportation, is also under consideration. The country already has 45 plants in operation for the production of biogas and more than 30 are under construction. The Ministry of Research is also studying an integrated biogas system to be put up at Quickborn, in Bavaria, whose biogas plants are to be connected to some factories. [Text] [Rome NOTIZIARIO DEL CNEN in Italian Oct 81 p 16] 5058

CSO: 3102/265

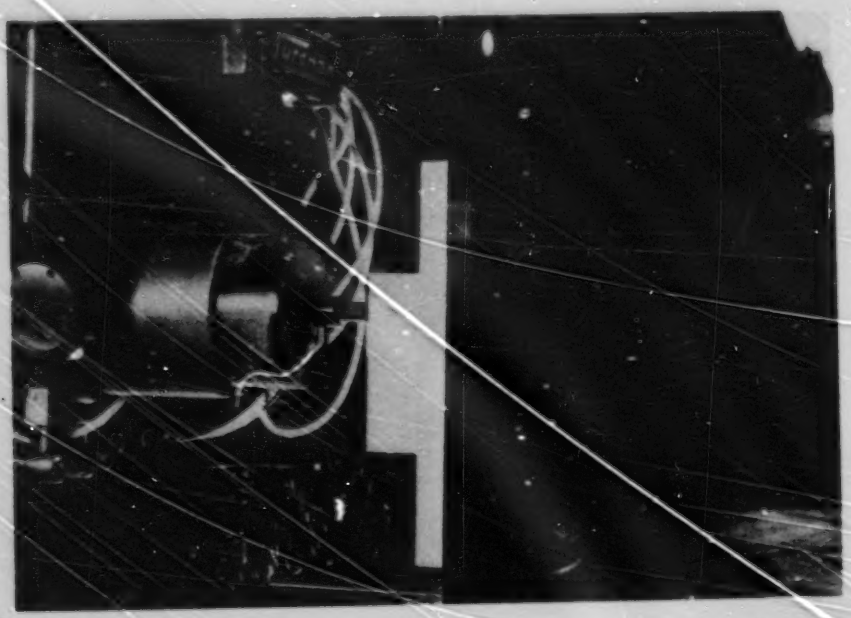
FRENCH FIRMS WORK TO INDUSTRIALIZE VERY HIGH SPEED MACHINING

Paris MACHINE MODERNE in French Mar 82 Supplement pp 15-17

[Article by Nicole Beauclair: "Tomorrow: Very High Speed Machining"]

> [Text] It is coming out of the laboratory to face industrial reality. Very high speed machining (TGV) is making its first appearance in aeronautical applications, but there are still many details to be worked out, particularly with regard to the drive mechanism and tooling.

In this article we shall barely touch on the technology of electrospindles in energized magnetic bearings inasmuch as that was taken up in several articles in MACHINE MODERNE (No 815 of May 1977 and No 842 of January-February 1980). However, we believe it worthwhile to call attention to their industrial applications, particularly in the machining area. For at present, although TGV machining has been extensively written up, it seems that many problems are not yet resolved and that we cannot expect production applications before the end of 1983.



The development of TGV machining involves intricate problems with regard to the technology of electrospindles. (Doc. S2M)

Energized magnetic bearings were put on the market in 1977, and their development led to the subsequent development of a whole range of electrospindles aimed at developing TGV machining. The perfection of such a machining procedure involves close collaboration by several technical associations.

First, the manufacturer of the electrospindle, the Magnetic Mechanics Company (S2M), the builders of machine tools, the manufacturers of cutting tools, the machine tool users (presently, the greatest application for this procedure is in aeronautics), but also the manufacturer of numerical controls. From this we can see how difficult it is to assemble all the necessary information and production parameters to get such a procedure into operation.

Mr Dussaux, general manager of S2M, recently explained the use of electrospindles on PMAs (energized magnetic bearings) for TGV machining. First, let us recall that increased cutting speeds offer a number of advantages, the most important of which are increased productivity, a reduction in cutting effort and improvement in the cutting surface. However, the development of TGV machining involves intricate problems with regard to the technology of the electrospindles which must be capable of very high rotating speeds while having strong motorization at their disposal.

Conventional electrospindles equipped with oil bearings or pillow blocks are not capable of simultaneously attaining this double objective and either favor speed to the detriment of power or the reverse. Moreover, their rigidity, on which precision depends, is not very great.

This discovery, according to Mr Dussaux, led to the work of developing and perfecting electrospindles equipped with energized magnetic bearings, a work in which S2M has been engaged for the past 3 years.

In fact, this type of bearing, in which the rotating part is suspended without mechanical contact (therefore, without friction) thanks to magnetic forces and electronic servomotors, permits rotating speeds which are almost double those obtained with ball bearings for the same shaft diameter, does not wear, does not need lubrication and consumes little power. To these advantages, which result from the absence of mechanical contact, we may add the advantages produced by electronic servomotors: automatic rotor balancing by rotation around the axis of inertia, extreme rigidity and the possibility of knowing the position of the rotor in the air gap and the stress on the bearings at any time.

As we shall see later, experiments are underway and, very fortunately, technicians are developing, from the same model, assemblies like the B 10/1000 which furnishes an effective power of 15 kW at 60,000 rpm. (The B 5/1250 furnishes a power of 5 kW at 75,000 rpm and the B 20/500 furnishes an effective power of 20 kW at 30,000 rpm.)

The PMA electrospindle comprises:

--The electrospindle proper with integrated slip-ring motor and magnetic suspension, the spindle being fixed on the machine frame with a cheek or flange. A cone arrangement and adjustable bear for holding the cutting tools keep the electrospindle extremely rigid and provide for easy automatic tool change;

--Electronic servomotor and control of magnetic suspension;

--Static frequency converter to power the tool-feed motor.

Provision for cooling the motor is assured by water circulation for the stator and pressurized air for the rotor. The controls can be operated from an electronic panel or from a remote control box; and the connection with the machine's numerical control can be thus accomplished providing for a high degree of flexibility in operating the machine. Several milling experiments have been made during the past few years, and some are now underway in France (at S2M and TMI Forest), the FRG and the United States (particularly at Boeing).

Experiments at S2M

As we have said, to our knowledge all experiments are being made with a standard electrospindle developing a power of 15 KW at 60,000 rpm. The tool is fixed in the nosepiece of the electrospindle with a slightly angled cone specially developed for high speed; a flexible adjustable bar holds the tool right regardless of speed of rotation. The magnetic bearings of the electrospindle are controlled by an S2M electronic servomotor panel.

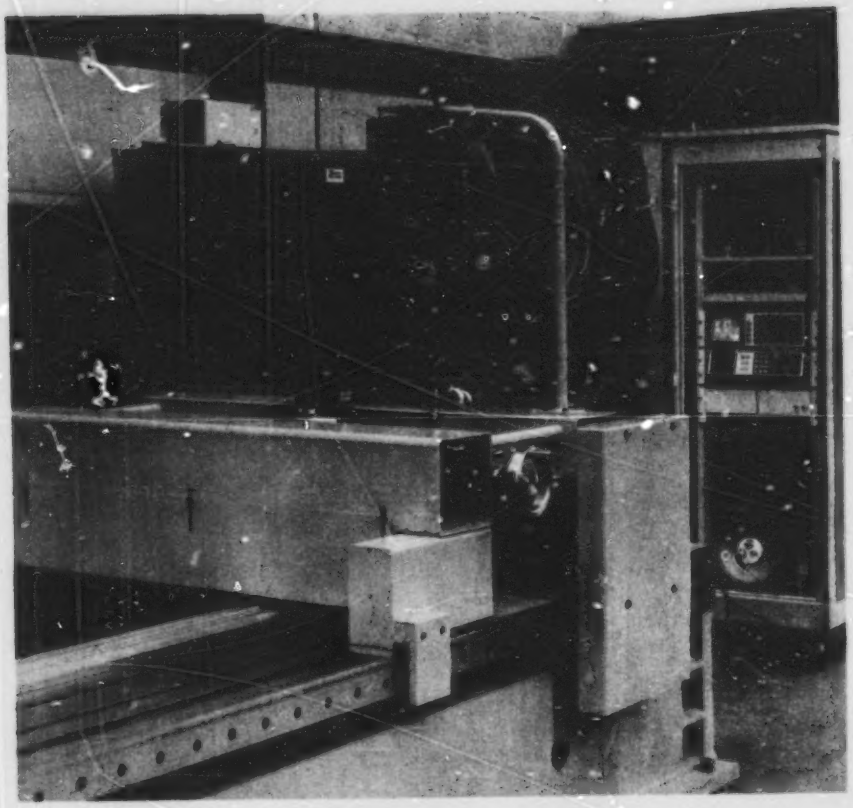
Since TGV machining requires tool feeds of 10 to 20 meters per minute, the S2M experiments are being conducted on a lathe simulating a milling operation. The solution to the problem of feeds consists in using a large-diameter disk (1 to 1.5 meters) of the material to be machined and securing it in a large-capacity lathe chuck. The electrospindle carrying the milling tool is then mounted on the lathe carriage.

The rate at which the piece is fed past the milling cutter is obtained by taking the speed of rotation of the lathe and the diameter of the piece being machined (for example, machining a 1-meter diameter with the piece rotating at 5 rpm gives a feed of $95 \times \pi \times 5$, or 15.7 meters per minute). This solution has the advantage of great flexibility in regulating the amount of feed and makes it possible to do surface or contour work.

Moreover, thanks to the lathe's automatic crossfeed, it is also possible to make lengthy machining cuts, essential conditions for obtaining stabilized parameters for measuring cutting power and stress, and also essential for an initial approach concerning the life of the cutting tools.

To get back to aeronautical machining conditions, the disks machined during the experiments are in AU4 GT4 aluminum using Rito tools, one or two-sided helical carbide milling cutters with the following characteristics: 10 degree cutting angle, 12 degree and 18 degree angles for the first and second clearances, 23 degree spiral and 25 mm diameter.

In this type of experiment the motor's static feed converter is of Jeumont-Schneider construction with 30 KVA power and a maximum frequency of 1,000 Hz, enabling the electrospindle to accelerate or brake in less than 10 seconds. An electric control panel is equipped with an interface normally connected to the CN [numerical control] of the machine being used. In addition to the information necessary for safe use of the electrospindle, this device also makes it



A two-way spectroanalyzer makes it possible to record the average power consumed during a given pass. (Doc. TMI)

possible to keep a continuous watch on the information provided by the electrospindle's position detectors and the currents in the bearings. This information corresponds respectively to the deflection of the tool under load and the cutting stress applied to it. Two oscilloscopes make it possible to observe these values during the trial runs.

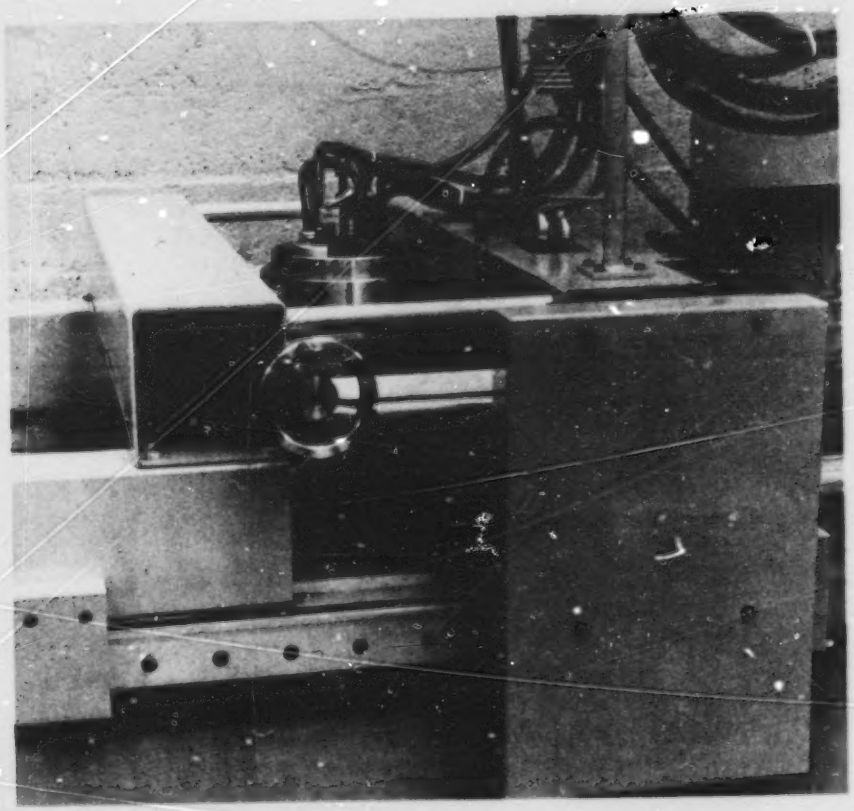
During the experiments (rough contour or surface milling), the feed of the piece past the tool is about 18 meters per minute, each pass corresponding to a piece 6 meters long (2 complete turns). Moreover, the rotating speed of the electrospindle is constant and equal to 54,000 rpm; the tool used is singletooth. Parameter b is regulated by longitudinal displacement of the carriage carrying the electrospindle; parameter a is obtained by the carriage's automatic crossfeed.

The trial runs, lasting 48 seconds, resulted in significant quantities of chips, amounting to 500 cubic centimeters, or 1.3 kg of aluminum. According to S2M engineers Habermann and Brunet, this accurate result given by the two oscilloscopes confirms the advantages of TGV machining with regard to productivity, reduced cutting stress and the quality of the surfaces obtained.

However, even though Mr Dussaux thinks these results and those obtained in the FRG and the United States have convinced him that TGV machining is now a reality, it seems that much is still to be done in order for this method to be used industrially. We ask nothing more than the details furnished by TMI.

From Laboratory to Industry

In Capdenac, the conservative approach is mandatory. Since 1979, TMI has been equipped with an electrospindle to verify the influence of TGV machining on yield and the interest this cutting technique might have on various types of machining (aeronautical and automotive parts). The trials being made in Capdenac are being conducted with the aid of the Dassault Company which, recently and jointly with TMI, gave Anvar a research and development file on TGV machining. The program includes a study of cutting techniques, the development of a numerical control device and servomotor with special shafts for contour cutting at 20 meters per minute and, lastly, the designing of a pilot machine specially made for TGV cutting.



The lathe carriage is supported on a cushion of air thus eliminating friction and permitting rapid tool feeds. (Doc TMI)

The first trial runs made with the B 10/1000 electrospindle soon made it apparent that it was almost impossible to verify the data. The problem was not simple, according to Pierre Tillement and Andre Greffiez, chief engineer and research head at TMI respectively since the feed frequency is 1,000 Hertz and one finds harmonics up to 25,000 Hz and above. For that reason, TMI first made it a point to obtain means for precisely measuring the power consumed. This was accomplished with a two-directional spectroanalyzer and, by having the analyzer record an image of the current and the stress of the feed on the motor, one obtains a record of the average power consumed during a given pass. This measurement, which is reliable, makes it possible to determine the effect of the slightest cutting parameter on the yield.

At TMI there was no question of simulating milling operations; therefore, it was necessary to construct a machining facility capable of approximating the characteristics of TGV machining. The carriage can attain 50 meters per minute with an acceleration of 0.5 g; it is supported by a cushion of air virtually eliminating friction and permitting very fast feeds. The machine bed, of tubular concept (square or rectangular cross-section) makes the structure light but rigid with a good rate of vibration absorption and good cutting performance.

Experiments made with Dassault using the AU4G have now made it possible to determine the effect of cutting angles, feed and type of cut on the yield in terms of chip volume per minute and kilowatts consumed. According to Andre Greffiez, it has been noted that the effect of high speed is appreciable, since, under the best conditions at present, we obtain 81 cubic centimeters per minute per kW compared with 58 for conventional machining (a gain of 40 percent). Moreover, we should note that TGV machining uses a highly variable (and therefore low yield) slip-ring motor and that the results recorded take absorbed power into account and not effective power.

Moreover, so-called conventional machining is performed at 6,000 rpm and at 3 meters per minute, which are exceptional conditions for machining aluminum. The machine used for this experiment is specially designed to work on this material. In the near future, trial runs with different parameters are expected to make it possible to evaluate the characteristics of actual motor powers to obtain still greater knowledge of cutting stresses, for perfection in TGV cutting tools is unfortunately not on a par with conventional cutting tools, and we expect to make still greater progress in this aspect.

The study of cutting characteristics and the determination of proper tools are being assured by the Dassault company which, besides having an abundance of experience in aeronautical machining, has excellent analytical facilities (micrography of chips, and so on). Moreover, the study of cutting offers great objectivity with regard to the choice of tools for the experiments. In fact, the experiments are being made with double-edged helical carbide milling cutters from various sources, some of which are Rito, Planche and Reine. But the development of tools for TGV machining requires many trial runs while varying the characteristic angles on the tools almost one to one; this is a long-range project which few toolmakers want to undertake. With regard to carbide tool manufacturers, it seems that in 1980 (at the IMTS in Chicago) Valenite Modco

performed a TGV machining operation at its stand with a hub-type milling cutter of its own manufacture; but up to now, no information leads us to think that this firm carried on further experiments in this regard or that any other carbide tool manufacturers have engaged in that undertaking.

It is an undertaking which, to sum up what we have said, should, however, end up in industrial application. In any case, the industrialists involved will derive benefit and, at the least, experience: more effective numerical control (the battle is now between Num and Elsag), different concepts of machine tools, high frequency measuring devices and, of course, the development of ever more effective cutting tools.

8568
CSO: 3102/212

SECMAI: HIGH TECHNOLOGY MACHINERY MANUFACTURING FIRM

Paris MACHINE MODERNE in French Mar 82 pp 15, 17

[Article: "Automation: SECMAI--From Mechanics to Drafting in CAO"]

[Text] In the beginning SECMAI [Industrial Machinery and Equipment Study and Construction Company] was a study office for mechanical projects. The company made a first turn in 1967, planning and building for Thomson a machine with numerical programming for punching printed circuits, then producing its first machines with numerical programming for reading blueprints, photographic layouts and drilling. A second turn was taken in 1972, when SECMAI introduced data processing in its systems. Two years later the company launched its initial modular systems: It was to retain the principle of modules for its interacting systems with basic modules making it possible to handle alphanumerics and graphics such as those involving connected blueprints and on the basis of which it was possible for SECMAI to progress from DAO [computer-assisted design] to CAO [computer-assisted plan]. Capable of innovating and adapting to a market in constant evolution, SECMAI has made a mark in an advanced sector: That of equipment for the handling and layout of printed circuits.

With the experience acquired in the planning and production of equipment for the handling and layout of electronic circuits, SECMAI has applied its DAO and CAO systems to all the other fields in which graphic handling and alphanumerics are important: hydraulics, pneumatics, public works, architecture and so on, and now electrical research and development.

From Graphic Blueprints to Connected Graphics

In a general way, SECMAI today has perfected its low and intermediate range products with high technology. Four types can be distinguished: machinery with numerical programs for punching printed circuits, operating machinery with numerical programs (photo-stamping equipment), factory-ready data processing systems of single-station or multistation DAO and CAO for the printed circuit and blueprint industry, and special machinery. It is with its numerical program machinery for the punching of printed circuits that SECMAI has moved away from the field of mechanics proper. Mechanics no longer represents more than a small amount of the company's sales. Patented in France but also in the United States, the laser phototracing equipment of SECMAI makes possible the accurate and economic manufacture of films used in the production of printed circuits as well as basic documents used in blueprinting before the production

of microfilms. The systems developed by SECMAI are planned according to the principle of modules, so much so that it is possible to move from DAO to CAO by adding functional modules. They are applicable, then, both to blueprint graphics proper, which originates with DAO and where the worker controls the operations of the equipment, and to the "connected" blueprints which, on their part, derive from CAO, the worker merely giving the machine the signal to begin. In all cases, their goal is to reduce the time necessary for designing or planning blueprints while increasing the viability and quality of the finished product, reflected on one hand by an increase in productivity--ranging from an increase by a factor of 2 to an increase by a factor of 10 depending on the systems and types of work--and on the other hand by an enrichment of tasks leading to greater creativity. Indeed, it is known that blueprinting represents approximately 70 percent of the activities of study offices (25 percent then, being devoted to planning and 5 percent to pure research). Built to order as a function of specific invitations to bid, special equipment represents some 5 percent of SECMAI's activities.

Succeeding While Remaining Independent

SECMAI, whose turnover increases from 30 to 50 percent each year, was awarded the Richard Medal in October 1981 by the Board of Directors of the Society for the Promotion of National Industry; and because of that SECMAI plans to continue its development and expand the range of its techniques and equipment while retaining its independent status. It is alone in planning electronics, data processing, and mechanics involved in its systems, whose mechanical assemblies the company undertakes itself. But SECMAI is also involved in hydraulics, pneumatics and optics. SECMAI calls on an outside construction firm only for the manufacture of mechanical parts, the supply of data-processing equipment, and peripheral equipment. SECMAI's personnel consists of technicians graduated from the major professional engineering schools and able to master the most diversified and most advanced technologies, with a common philosophy based on the notions of modules and interaction.

Very recently CIMSA [Military, Space, and Aeronautical Data-Processing Company], an affiliate of Thomson, ordered from SECMAI a compact multistation CAO color system, type RS 4140, for the handling of electronic circuits--remarkably complex because of specific restraints--used in its products. One will also recall that SEMS [European Mini-Data-Processing and Systems Company] will acquire a high-technology SECMAI 4140 + RS 4140 system (what is involved is a multistation color system with two computers) so as to handle cards with up to 650 elements.

Statistics on SECMAI

Established on 1 January 1948, SECMAI has a capital of 120,000 francs. It is headed by Francis Orth (chairman of the board and president) and Andre Frehling (director of technology and research). Located at Alfortville, it has two production facilities with an area of approximately 1,500 square meters (50 percent plant and 50 percent office space) and a staff of 28. Its turnover which was 7,637,000 francs in 1978 increased to an estimated 16 million francs in 1981. Its ratio of exports to total sales ranges from 5 to 10 percent while research represents 10 percent.

2662
CSO: 3102/211

CAD/CAM IN AUTOMOBILE TOOL MANUFACTURING

Wuerzburg AUTOMOBIL-INDUSTRIE in German Mar 82 pp 39-41

[Article by Wilhelm Hensmann: "CAD/CAM in Automobile Tool Manufacturing"]

[Text] The making of car body tools has always been known as a difficult and time-consuming task because of the expensive modification and adaption work involved. The development of CAD systems and the use of NC techniques for production and testing purposes offers the possibility of formalizing the work and rationalizing the whole process through the multiple use of stored work piece information. The programmer takes the place of the template cutter. A large computer system with graphics terminal is employed. In the report presented here the exchange of data between a CAD system, a numerically controlled measuring instrument and an NC milling machine for the manufacture of templates, models and tool contours is described.

CAD (Computer Aided Design) describes the entire field of activity where computer systems are employed for the work preparatory to manufacturing. Automatic plotting of drawing, which, however can only be carried with a relatively expensive hardware configuration and complex software systems, has proved to be an area of major importance. But calculating and test programs in the area of construction are equally a part of CAD work. The entire field of computer application in manufacturing is called CAM (Computer Aided Manufacturing). The area of emphasis is NC technology and/or programming. The terms CAD and CAM are often used together, since the tasks they deal with often blend into one another. Efforts are being made to achieve multiple processing of data that has been stored, that is, additional use of parts drawings in the computer's internal memory. Digitized geometry information is also to be used for manufacturing tasks, so that the programming of numerically controlled manufacturing equipment is also simplified. This article describes an installation in which a link between CAD and CAM was achieved to a large degree.

1. Development of Work Methods

Plans on film--that is, lines drawn on wrinkle-resistant film with extreme accuracy, but not provided with dimensions--templates, models, duplicating milling machines and a great deal of work done by hand characterized the manufacture of body tools for decades, and to some extent they still characterize it today.

When NC technology became available about 10 years ago, with high-output NC machines, NC controls and NC programming methods, it was put to use by all automobile manufacturers to speed up the steps in the production of templates and models, and also in manufacturing tools.

Manual work in the shop was replaced by the work of a machine, the programmer took over from the template maker. Because of the complicated forms involved, programming from the outset was possible only with the help of a large computer, that is, CAM became part of automobile tool construction. The next step was to delegate additional tasks to the computer which had been carried out by hand by the template maker and the model builder, to be exact, the creation of contour lines between given points and the creation of smooth surfaces between these lines. This specialized area, which forms part of CAD because of the methods employed, substantially expanded the spectrum of NC programming possibilities. The goal, however, was clearly the manufacture of parts, not design and the plotting of drawings.

Not until recently have the possibilities existed of speeding up design with the help of the computer. As a consequence of graphics screens, less expensive computers and, above all, constantly improved software it is becoming possible to use CAD both during the design of the product as well as during the design of the tools and equipment for the product.

The economic advantage will lie principally in the possibility of rapidly retrieving stored data for the subsequent steps. Using the data, which describe the product in lines and surfaces, for the production of contours and surfaces for the tools, and taking over data from CAD tool construction for the milling, drilling and turning of fixtures and functional parts raises the possibility of a work sequence in which the precision of the tools depends essentially only on the precision of the NC machines.

2. Configuration of the Installation

The entire installation for the computer-assisted production of models and tools is composed of the following components, whose data link is shown in figure 1.

Large Computer

Because of the large volume of data which must be accessed at the same time, tasks in the CAD/CAM area, where digitized drawings must be manipulated, require an EDP unit with a suitably large memory capacity in the working memory and in the peripheral units. Access to the computer is usually a "time-sharing operation," that is, it is used simultaneously by several persons for different problems. Access is by means of screen terminals, some of which are set up as graphics terminals. The surface programs are programmed and checked over the graphics screen (fig. 2).

NC Drafting Machine

This is a combined numerically controlled drafting and digitizing machine (fig. 3). This part of the installation serves to prepare and check the data. It is linked to the main computer and is itself provided with a graphics work station (fig. 4). There is no direct data link between the measuring and the drafting machine, rather the measuring data are transmitted by punched tape. The punched tape is checked by the drafting machine before it is processed by the milling machine controls.

NC Measuring Machine

The measuring machine (fig. 5) receives data and checks data already in storage. It measures contours and shapes against master data and, particularly for cutting contours and supplemental surfaces, it supplies measurements to programming by way of the drafting-digitizing machine.

NC Milling Machine

The templates, models and tools are made on an NC milling machine, whose equipment and size are suited to the manufacturing task (fig. 6).

3. Economy

Because of the high investment costs, it is important that all the installations operate full-time in two shifts. This is possible because both models and templates as well as tools are manufactured. The NC drafting unit also checks NC programs from equipment construction and provides tool construction with data. Following a pilot phase, each step was adopted in practice only when its economy had been proved. Time savings of between 30 and 50 percent and cost savings of between 5 and 10 percent were achieved in the manufacture of templates, models and contours of all kinds in tools. Surface milling in tools and construction at CAD work stations are still in a pilot stage. Subsequent data on economy are not yet available, but it can be considered certain that the important point for economy is in the one-time generation and rapid transferral of data. The time savings at CAD work stations lie not so much in the construction process, at least not of the order that any economy would result with the high investments of about DM 400,000 per job, but in the multiple use of data that has been stored in the memory. The data can be data about the shape of the finished part, which, for example, have to be moved into other manufacturing situations, as well as data about standard parts.

4. Personnel

As this technology is still in a very turbulent process of further development, the demands made on the willingness of the workers to learn and continue their education are high. For parts programming it has proved to be worthwhile turning to very good skilled workers who have taken a technician's examination, for software development training as an engineer or qualification as a mathematician is mandatory. When estimating the capacity of the parts programmer, it must be considered that all NC programs are used only once.

The need for programs for the milling machines is higher than for normal NC machines, which are used for short production runs, by a factor of at least 10. This results in quite different proportions when planning staff numbers. Particularly in the plotting of templates and models, in which feed and advance motions are still very high, five programmers often have to set up programs for a single machine. In order to absorb peak loads, it is advantageous to blend this type of programming with the NC programming of production parts.

5. Working with Suppliers

Since a large part of the tools and equipment are not made in the company's own equipment and tool shop, but are ordered from suppliers, it is necessary to divide the work and prepare means of communication. It is possible, for example, to premill the original models and have the finishing carried out by a supplier. It is also possible to make drawings in rotated positions or reduced-scale drawings available to the construction companies. The exchange of punched tapes makes it necessary for the supplier to own the same kind of NC machine. Normalization of NC data, including data for NC measuring machines and NC drafting machines, is already well advanced. Modern controls recognize whether a punched tape is perforated in EIA [Engineering Institute of America] or in ISO [International Standards Organization] code. There needs to be some basic agreement about the format of punched tape.

CAD intersection points have not yet been normalized. Major American CAD users and suppliers are making initial efforts to define an intersection point (IGES--initial graphics exchange specification).

6. Future Developments

NC machines and NC controls have already reached a high technological standard. Five-axis machines will probably become increasingly important for the milling of surfaces, particularly in combination with CNC [Computer-Assisted Numerical Control] controls, which have large data banks and have the banks filled directly from the data administration computers. The strongest development can be expected in the area of software. This holds true both for the area of data handling from design to the finished tool and for CAD work stations.

There can be no doubt that development here is only at the beginning. Technically, the most serious problem for the field of automobile tool construction will probably continue to be the totally unsatisfactory size of the graphics screen. Anyone who can offer a solution here will find a ready market.

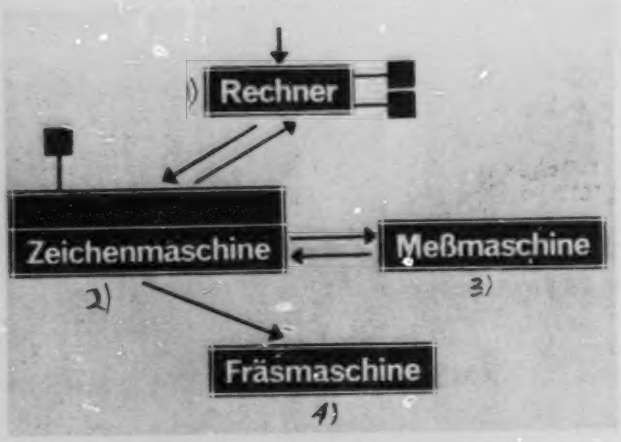


Figure 1. Data link between the components in the system

Key:
1. Computer
2. Drafting machine
3. Measuring machine
4. Milling machine

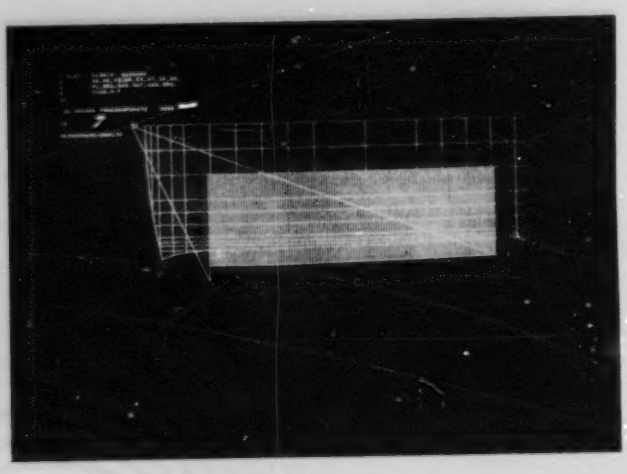


Figure 2. Surface program on the graphics screen

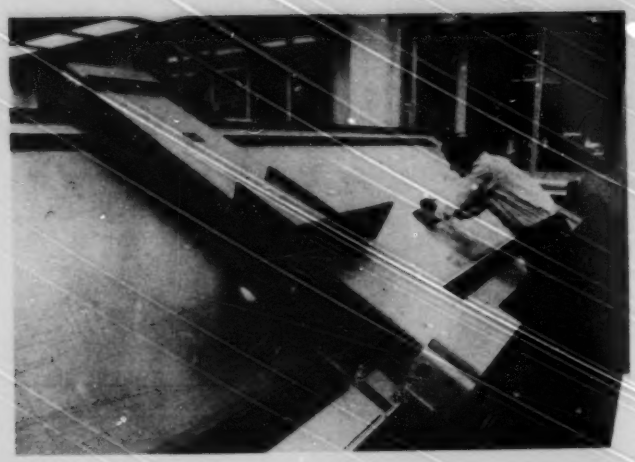


Figure 3. Combined drafting and digitizing machine

Figure 4. Graphics screen on the NC drawing unit

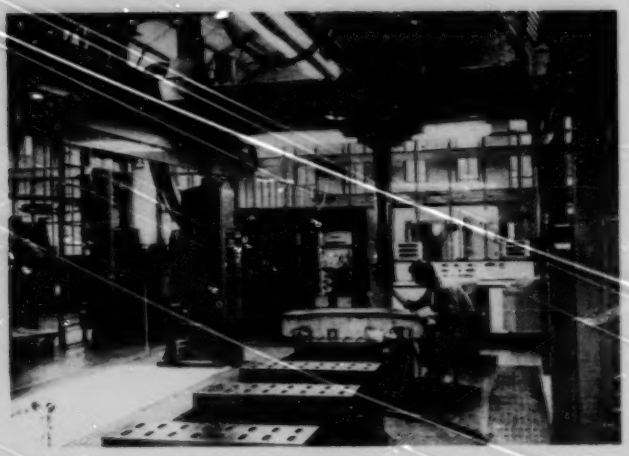


Figure 5. Numerically controlled measuring machine

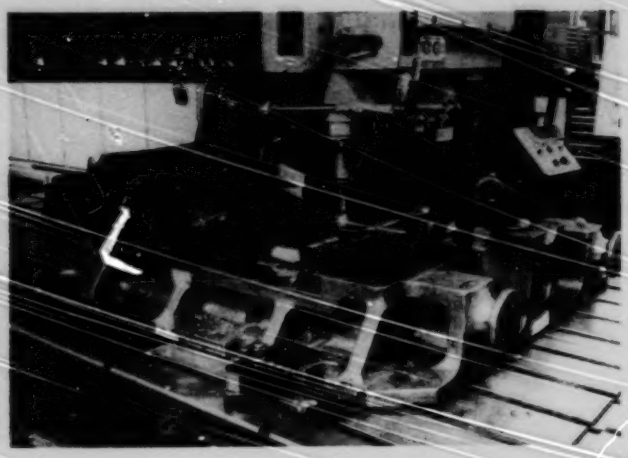


Figure 6. Tool production on an NC milling machine

9581
CSO: 3102/261

STATE TO AID INDUSTRIAL TECHNOLOGY WITH FUNDS FOR CAD/CAM

Copenhagen DATA-NYTT in Swedish 5 Apr 82 p 14

[Article by George Strachal]

[Text] Between 1980 and 1985 the Board for Technical Development (STU) will invest 40 million kronor to develop industrial technology. CAD/CAM is an important part of this development. During the 1982/1983 fiscal year about 3 million kronor will go to research at institutes of higher learning and slightly less to pure industrial development.

During 1983, aid to industry probably will increase and surpass research. STU's investment in CAD/CAM includes a plan to construct CAD/CAM centers at the institutes of technology in Stockholm, Goteborg, Linkoping, and later in Lulea and Lund. Borje Stark is in charge of this program at STU.

STU's involvement in the development of industrial technology with CAD/CAM represents a contribution by the state to a necessary technological development. STU entered this field when it began supporting certain research projects at the institutes of technology in Stockholm and Linkoping. These projects eventually evolved into pure research programs and in 1980 this support became a program for computer-assisted design and manufacture.

Companies Interested

The interest on the part of various companies became apparent when SAAB contacted STU in 1976. SAAB had acquired a Gerber-type CAD system. This system had excess capacity and SAAB wanted to offer it for some useful purpose.

From 1976 to 1978 STU offered training in this system to small companies. Since then STU has been involved in the so-called Malardal Project in which tool manufacturers have been able to learn about CAD/CAM.

"Recently we have noted rapidly increasing interest from small companies, among others," Borje Stark said. "At present, we are involved in a CAD/CAM program of a purely industrial nature. The Institute of Industrial Technology Research (IVF) will publish a report this fall entitled "CAD/CAM at Industrial Companies."

CAD/CAM Centers

In cooperation with IVF, STU intends to establish centers for research in industrial technology in Stockholm, Goteborg, Linkoping, Lund, and Lulea. Such centers actually exist already in Stockholm, Goteborg, and Linkoping. These centers will also have special CAD/CAM groups. Each group will consist of five persons involved purely with developmental work. The CAD/CAM groups will be an integral part of the industrial technology research.

"Our plans are being implemented already," Borje Stark said, "and agreements with the institutes of technology will be concluded in the near future. It must be remembered that this effort is above and beyond the present budget. What the government decides in the future is another matter."

"We cannot say today what the investment in these centers may yield. This can be done only after the government makes its decision. In addition, we are well aware that it may take time to establish the centers. Among other things, expertise is needed here which may not be so easy to find."

According to the preliminary program, STU believes that the following must be developed:

Knowledge concerning the principles of systems design and methods capable of describing the design and planning process as a basis for systems development.

Knowledge of computers, including peripherals and software.

Knowledge of principles for constructing workplaces and man-computer, terminal-computer, and computer-computer communications.

Geometric product and part models in computers, which are of vital significance for development.

Knowledge of how modern data-base technology may be utilized to make possible a desired development and knowledge of how the tools for constructing data structures may be used to describe the relationships involved in computer modeling.

Since these systems must be constructed as computer assistance to man, it is extremely important to develop communications technology that is adapted for human use.

Limitations in the flexibility of computer systems must be overcome with regard to product development and the development of production technology.

The modern tools of systems development must be learned for developing CAD/CAM systems.

"I believe that Sweden is in a good position by international standards," Borje

Stark said. "The rest of the world is interested in us as a possible partner. In addition, there is total unity among our politicians. They understand how important it is for Sweden to invest in further technological development in order to compete internationally.

9336
CSO: 3102/269

SWEDISH COMPANIES DEVELOP IMPROVED PIG IRON PROCESSES

Stockholm DAGENS NYHETER in Swedish 19 Apr 82 p 8

[Article by Lars-Ingmar Karlsson]

[Excerpts] While blast furnaces throughout the world are being utilized far below their maximum capacity, several large Swedish firms are hoping to sell processes that could complement or replace blast furnaces.

"Our methods are more energy-efficient and easier on the environment than the old blast furnaces with their large coking plants," they say.

The new Swedish pig iron methods have already attracted the interest of prospective customers, according to the firms.

Three new Swedish pig iron processes will compete with blast furnaces. Boliden wants to market its Inred method, SKF Steel its Plasmasmelt, and Asea and Stora Kopparberg their Elred.

"The three Swedish methods began to be developed at approximately the same time in the early seventies," said John Olof Edstrom, professor of production technology specializing in the mining and steel industries at the Stockholm Institute of Technology.

"One of the motivations behind the development was that Sweden wanted to continue pig iron production on a small scale."

"It is hardly feasible to construct blast furnaces with their coking and sintering plants for production below 1 million tons per year. The investment costs would be much too high."

Many Differences

It is in this area that the three Swedish methods are most advantageous. They simply skip one stage of the process. Coking and sintering plants are not used. The raw iron material is finely ground concentrate direct from the mine. The

Asea/Stora Kopparberg Elred process and Boliden's Inred also require no coke and, therefore no coking plant. SKF Steel's Plasmasmelt does require coke, but the quantities are small and no plant is needed.

In this way, the methods save energy. In addition, they do not pollute as much as blast furnaces with their coking and sintering plants. Thus, environmental regulations are more easily fulfilled.

In all three processes the iron ore concentrate has its oxygen removed, it is "reduced," in two stages. The procedures, on the other hand, are different.

In the first stage, Elred and Plasmasmelt have different types of so-called fluidized beds. Simply stated, these are beds that are kept floating, or are fluidized, by blowing compressed air from below.

In the Inred process coal powder is burned in an oxygen flame during the initial reduction.

In the second stage, Elred and Inred are most similar. Both methods employ heating with one or more electrodes that produce an intense electric arc. Both also produce a surplus of combustible gases. These are used to generate electricity.

Originally, the second stage of the Inred process used electric coils in the furnace walls for heating. This so-called induction heating now has been changed and electrode heating will be tested, instead.

Plasma Torch

Plasmasmelt utilizes a so-called plasma torch in its second stage. It is heated electrically and is capable of heating gas to several thousand degrees. This gas "cools" to just under 1,000 degrees during the final reduction, but it is still warm enough to heat the first stage.

Plasmasmelt receives its electricity supply from the ordinary power network.

SKF Steel also uses its plasma technology to produce so-called sponge iron. The raw material for this iron is a more highly refined form of ore, pellets, which are produced on a large-scale by LKAB (the LKAB Mining Company). The pellets are only partially reduced to a porous "semi-finished" pig iron.

Sponge iron works, or direct reduction works as they are also called, normally require an inexpensive supply of natural gas. SKF, however, has adapted its plasma technology so that the necessary gas can be produced from coal during the process itself.

"Sponge iron was developed originally in Sweden. Since then, it has been developed further in other countries. The number of sponge iron works is rising, especially in countries with a large supply of natural gas," John Olof Edstrom said.

Will Not Replace

But sponge iron is the raw material for only an extremely small portion of the world's steel--only about 2 percent. About 20 percent of the steel is made from scrap iron. The rest, almost 80 percent, is made from pig iron produced in blast furnaces.

The three Swedish pig iron processes promise iron that is 20 to 30 percent cheaper. John Olof Edstrom is more cautious in his estimate and believes that production costs may be reduced by 10 to 20 percent.

"We are a long way from replacing the blast furnace with these three processes. Blast furnaces have been made better and better and they are now as energy-efficient as theoretically possible," he said.

In addition, pig iron from blast furnaces is well suited for subsequent steel processes.

"The Swedish methods would be most beneficial at existing iron works where an increased capacity is desired. An increase of several hundred thousand tons of iron annually is possible."

Compared

John Olof Edstrom has compared the three methods and examined the significance of electricity prices, among other things.

"On a small scale with a production of several hundred thousand tons of iron annually where cheap electric power is available, Plasmasmelt is most profitable. It is also easiest to implement, since it does not generate its own electric power."

With higher electricity prices and in plants producing about 1 million tons, Elred is best. In both cases, Inred is between Elred and Plasmasmelt.

The advantage of both Elred and Inred is that these methods generate their own electricity. This could be important in certain cases, for example where the outside electricity supply is undependable.

"In Sweden and many other industrialized countries electric power is cheap and Plasmasmelt has certain advantages," John Olof Edstrom said.

He said that pig iron from Plasmasmelt is most like iron from blast furnaces, but the method that should be chosen is wholly dependent on local conditions and raw materials.

"All the methods have their advantages. It is too early to rule out any of the processes," he said.

Sweden Ahead

Despite their advantages of energy efficiency and compatibility with the environment, the three Swedish processes have found few eager customers. Estimates on the overcapacity of iron from blast furnaces vary, but it probably is at least 10 percent.

Sweden probably has a slight head start since the new processes are most highly developed here, but other countries are on the way and certainly will produce their own processes as energy and environmental requirements become more stringent.

The companies themselves are extremely optimistic. They hope that better iron and steel markets will increase the need for their methods.

"Recently we have noted a newly-awakened interest in Elred," Evert Wijkander of Asea said.

Elred has been tested on a small scale for several years. At present, Elred is not being tested, but further experiments are planned along with prospective customers abroad.

"We believe we can construct plants for 200 to several million tons of pig iron each year. A suitable capacity for the first plant would be between 300 and 500 thousand tons," Evert Wijkander said.

After 1985

"Such plants could be in operation after 1985."

A new pilot plant for Boliden's Inred process will begin operating in several days. Hans Elvander, who is responsible for the Inred technology, believes that once this plant has been tested larger plants could be built, preferably with a capacity of about 400 tons.

"We hope that during the spring of 1983 we will be able to quote a price for an Inred plant to a North American firm that is interested in the method," he said.

SKF Steel also is discussing the sale of its Plasmasmelt process to customers outside Europe.

"Two customers we are negotiating with could even purchase plants with 250,000 ton capacities before we have conducted experiments with larger plants," Sven Santen of SKF Steel in Hofors said.

Other Applications

So far experiments are being conducted with an annual production of only several thousand tons. It is hoped that in several years a pilot will be

produced with an annual capacity of 60 to 70 thousand tons.

"This size is commercially marketable for applications other than pig iron production. We also are using plasma technology to recover metals from flue gases and to produce ferrochromium," Sven Santen said.

There is already one commercial application of the plasma torch. It is in the company's own sponge iron plant in Hofors. The plant was converted just over 1 year ago and it became profitable again after being down several years. SKF also hopes to sell its sponge iron method, or Plasmared as it is called, to other firms.

In Plasmasmelt, as in Elred, the two stages have not yet operated concurrently. Concurrent operation should cause no problems, however, according to SKF Steel and Asea/Stora Kopparberg.

9336
CSO: 3102/253

SCIENCE POLICY

TWO INDUSTRIES DELETED FROM CODIS, TWO ADDED

Paris L'INDUSTRIE DU PETROLE GAZ-CHIMIE in French Jan-Feb 82 p 52

[Article: "Offshore Drilling Is No Longer Part of the CODIS Program"]

[Text] The Ministry of Industry has just entrusted to CODIS [Interministerial Committee for the Development of Strategic Industries] two new subject areas: Molecular chemistry and engineering goods and services, which have just replaced mass consumption electronics and offshore drilling, both of whose present status is considered to be satisfactory (see L'INDUSTRIE DU PETROLE GAZ-CHIMIE, No 537, p 5).

Molecular chemistry represents a state-of-the-art activity that is sharply on the rise, stimulated by its connections with other advanced activities (electronics, energy, aeronautics, public health). But in France it holds an insufficient share for an industrialized country. CODIS proposes to increase the growth rate of molecular chemistry by important measures bearing on research, investments and industrial structures.

As for the engineering goods and services sector, it is still underexploited and still threatened by major American and Japanese groups which dominate the market and by new competitors able to offer more advantageous prices.

The government's goals will thus be as follows:

1. To increase the establishment of French engineering goods and services in the industrialized countries, especially in the United States and Japan;

2. To improve capabilities of cooperation with French contractors (or operators) (public sector and private sector, domestic market and export market);

3. To play a more important role in the improvement of research;

4. To become organized to sell profitably the engineering goods and services of the intermediate industries and more modest sized projects;

5. To penetrate the new markets of Asia and Latin America more effectively without, however, losing the share of activity maintained so far on the African continent;

6. To meet the challenge of worldwide competition in engineering goods and services through the energetic development of the methods and tools of the profession.

Let us recall that CODIS was established in 1980 to encourage the development of future industrial activities. It includes seven industrial sectors: In addition to the two mentioned earlier, robotics, office computers, bioengineering, energy conservation and textiles.

2662
CSO: 3102/209

DRAFT LAW ON RESEARCH, TECHNOLOGY PRESENTED

Paris L'USINE NOUVELLE in French 4 Mar 82 p 53

[Article by Pierre Virolleaud: "Research and Technology: After the Rhetoric, Action"]

> [Text] The development of industrial technology is slated to be one of the major beneficiaries of the strong impetus to be given to research. With a budget representing 2.5 percent of the Gross Domestic Product, the government will have the means to pay for its goals.

The draft law on "orientation and programming" which French Minister of Research and Technology Jean-Pierre Chevenement was scheduled to present at the meeting of the Council of Ministers last Tuesday is the expected sequel to the extensive national debate organized around regional meetings and the national conference. It confirms a general goal: Over 3 years to bring outlays for research and development to 2.5 percent of the Gross Domestic Product, thanks especially to the research carried out by enterprises, which will reach 1.5 percent of the Gross National Product; this implies growth of 8 percent a year in funding by enterprises. On its part, the civilian research and development budget will increase at an annual rate of 17.8 percent.

The draft bill also specifies the measures to be undertaken. Industrial activities approved among the economic, social, and cultural issues assigned for completed research are as follows: Agrofood, raw materials, robotics, mechanics, materials, molecular chemistry, biomedicine, scientific instrumentation, drugs, engineering and engineering goods, lumber sector, and land transportation.

The draft bill calls for the continuation of the major civilian programs (nuclear space, aeronautic, ocean) and lists what the seven new "core" programs will be--programs in which public research organs, domestic enterprises, and the research centers of private firms will participate. This list will be updated each year.

The new "core" programs are:

1. Rational utilization of energy and energy diversification;

2. Biotechnology advances;

3. Mastery over the development of the electronics sector;

4. Scientific research and technological innovation in the service of Third World development;

5. Research on employment and the improvement of working conditions;

6. The promotion of French as a scientific language and the generalization of scientific and technical culture; and

7. Technological development of the industrial network.

So much for programming. As far as orientation goes, one will note especially the expressed wish contained in this draft bill to facilitate free interchange of persons and teams among organizations, in higher education, and in enterprises. Two new legal units will facilitate the implementation of this law.

Scientific and technical public enterprises will offer flexible administration and sizable capabilities for improvement, namely, through the creation of affiliates. Analogous to the GIEs [Economic Interest Groups], the GIPs [Public Interest Groups] will bring private and public partners together for a specific period, with the public partners in the majority.

2662
CSO: 3102/209

BRIEFS

CONTROL OF TECHNOLOGY TRANSFER--France has just established a committee for "extremely rigorous" control over technology transfers, specifically to East European countries, it was reported at the Ministry of Defense. The same source notes that France is "one of the European countries best equipped to exercise extremely strict control" over technology transfers. This committee, placed under the direct control of Premier Pierre Mauroy, operates with the direct participation of the Ministry of Defense, the Ministry of Foreign Affairs and the General Secretariat of National Defense (SGDN), it is reported. A new control procedure was established, explained Minister of Defense Charles Hernu, so that French advanced technology, at times ahead of American technology, may be completely protected. This "strictly French" procedure, which distinguishes France from some other European countries, covers all transactions, even civilian ones, which may have spillover effects in the military domain, the minister added. However, this procedure is separate from the control of another organization, COCOM [Coordinating Committee] this one international, of which France is a member. Charles Hernu pointed out that France is thus equipped with two procedures for technological protection, that of COCOM and its own. This protection is additionally reinforced by the new executive of the directorate of security-defense protection, which replaces military security and whose mission is to insure the security of French industries and concerns deemed to be "sensitive" as well as of their personnel. [Text] [Paris AFP SCIENCES in French 18 Feb 82 p 8] 2662

CSO: 3102/209

FRANCE, ITALY SIGN AGREEMENT FOR ATR 42 PROJECT

Milan IL GIORNALE NUOVO in Italian 29 Apr 82 p 24

[Text' Rome, 28 April--By the end of 1985, Aeritalia and Aerospatiale will start the first shipments of the "ATR-42"; the abbreviation means "42-seat regional transport aircraft." The preliminary studies were completed months ago and quite naturally led to yesterday's signing of the memorandum of understanding between the Italian and French governments.

The aircraft will cost a little bit less than 8 billion lire in present-day lire; it will be equipped with two Canadian Pratt and Whitney engines which will generate a total capacity of 3,600 horsepower; it will have a range of 1,300 kilometers; it will be able to carry 42 persons although a 49-seat version is also planned.

The builders--Aeritalia and Aerospatiale--believe that the world market for these short-range and limited-capacity aircraft will come to about 2,000 airplanes over the next several years. The Italian-French initiative is designed to capture a third of this demand which means building and selling about 700 aircraft over a period of several years with a total billing volume of very close to 5.5 trillion lire. The sale of the aircraft has been entrusted to a 50-50-held company called GIE (Economic Interest Group) with headquarters at Toulouse.

The division of labor among the two partners calls for Aeritalia to build the fuselage and the tail assembly at its Pomigliano and Arco plants, while Aerospatiale will build the wings at Toulouse and will be responsible for assembly. The added value will be exactly divided in two equal halves and the same is true of the sales proceeds. The prototype is expected to fly in August 1984.

The agreement signed between Italy and France also calls for an interesting possibility: Aeritalia might be called upon to join the British-French-German consortium which built the Airbus A-300-B-4, which is building the smaller version of the A-310 and which is getting ready to build the A-320. Italian participation, to be decided within the next 3 months, would involve this latter aircraft.

5058
CSO: 3102/265

BRIEFS

BRITISH LEYLAND, HONDA AGREEMENT--Honda and British Leyland have extended the technical agreement worked out in 1979 and signed an agreement for the joint development and production of a new 2,000-cubic centimeter luxury car. The joint production announcement was made in Tokyo by Honda President Yoshiki Kawashima. The new model, called "BL-Honda," is to be based on the blueprints of the new "LC-10" by BL [British Leyland] and a new, more powerful version of the "Accord 1800" by Honda. Honda and British Leyland would each--according to the terms of the agreement--produce the respective versions for sale on the Japanese, European, and American markets, probably starting in 1985. The models would therefore differ in terms of their outward appearance even though they would have the same engine and the same mechanical parts. The sales organization for the United States market will be similarly independent. The cost of developing the project will be divided among the two partners who however do not intend to extend their cooperation to capital "partnership." Nissan, which is studying the construction of a facility in Great Britain with an investment of 200 million Pounds Sterling, has made it known that it does not think it has to modify its plans following the agreement between BL and Honda. [Text] [Turin ATA in Italian Jan 82 p 5] 5058

CSO: 3102/265

END

JPRS 81035

11 June 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 106

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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JPRS 81035

11 June 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

No. 106

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ELECTRONICS

PHILIPS/RTC PRODUCES WORD-SYNTHESIS CIRCUIT

Paris ELECTRONIQUE ACTUALITES in French 12 Mar 82 p 13

[Text] It is the turn of Philips/RTC (Radiotechnique Compelec) to enter the field of automatic speech processing with a prototype speech-synthesis circuit, the MEA 8000. Using a voice box model (formants + LPC), this non-memory circuit is primarily a microprocessor peripheral designed typically for integration into microcomputers.

The MEA 8000 circuit is presented in a 24-pin DIL package, using N-MOS technology with a single +5 V supply. It is based on a mixed word-synthesis technique, since it combines the method of formants with LPC (linear prediction coding). The method is primarily intended to achieve a good compromise between reproduction quality and storage economy.

The electronic model used by Philips is relatively simple: it consists of a two-state wave generator which mixes periodic signals (fundamental to voiced sounds) and white noise (non-voiced sounds), feeding a cascade of four resonators (in fact an eighth-order digital filter). Each resonator is programmable on two parameters, resonance frequency and bandwidth. Linear interpolation occurs at each parameter reset, namely at a rate of 8 kHz. The output sampling rate is 64 kHz, reducing the requirements of the external analog filter.

Each group of parameters is supplied by a 32-bit word (accessible from an 8-bit bus), providing a basic word overlay whose duration is programmable (8, 16, 32, or 64 ms). The signal amplitude is also programmable.

Memory Efficient

In this respect, the Philips seems particularly interesting because of its flexibility, since all its coding parameters are programmable. In particular, this characteristic makes it possible to synthesize non-voiced "sentences."

This circuit is probably also among the most memory-efficient on the market, even though it has no internal ROM. Indeed, in its simplest configuration with an MEA 8000 circuit and a microprocessor with 2 kbytes of internal ROM memory, it can produce 15 seconds of speech, or an average of 20 to 25 words. Beyond this, it typically requires 1000 bits of ROM or EPROM memory for each additional second of speech.

The MEA 8000 is primarily designed as a microprocessor peripheral, and the main Philips target is clearly the market of synthesis systems integrated into microcomputers (or into cards where the microprocessor already controls other functions). It uses less than 1 percent of microprocessor time.

In France, the practice is for the user to provide RTC with a cassette containing the required sentences. Philips (RTC beginning in September) then proceeds to analyze them, encode them, and burn them into an EPROM.

After customer testing, iterations are still possible for quality improvement.

11,023
CSO: 3102/213

THOMSON-EFCIS OPENS PLANT FOR MANUFACTURE OF ULA'S

Paris ELECTRONIQUE ACTUALITES in French 19 Mar 82 pp 1, 15

[Article by JPDM]

[Text] One year ago, the components branch of Thomson entrusted EFCIS with the responsibility of establishing a custom circuit department, based essentially on the customization of prediffused circuits, supported by a unit for designing and fabricating these circuits, separate from the actual plants of the integrated circuit (bipolar) division of Thomson-CSF, located at St. Egreve, near Grenoble, and from the EFCIS company (65 percent Thomson-CSF), located in Grenoble itself (see ELECTRONIQUE ACTUALITES, 27 March 1981). This unit is now completed, and by April will have installed all the staff responsible for the various phases of circuit design. Its name is DCS (Special Circuits Division) and it falls entirely under the responsibility of Thomson-EFCIS, the name henceforth representing not only a brand, but an entity combining joint administrative, marketing, sales, and quality control staffs. Beginning in April, DCS will offer prediffused C-MOS's with metallic grid and 144 cells (720 pairs of transistors), or 300 cells (900 pairs), as well as a 400-component linear prediffused wafer, known as "polyuse."

Before the end of the year, they will offer five C-MOS, metallic grid arrays, five 5 micron/10 ns C-MOS silicon grid arrays (up to 968 cells), and a 3.5 micron/5 ns C-MOS silicon grid array. A sub-nanosecond bipolar array will also probably be offered at that time.

A Service Adapted to All Needs

Thomson's objective in installing this unit is to offer a custom circuit service independent of its bipolar and MOS plants, so that the latter will devote themselves solely to the mass production of standard and innovative circuits. The type of circuit offered will depend on each user's needs: prediffused wafers when the quantities requested are small and lead times are short, pre-characterized (or catalog) circuits when the quantities exceed 20,000 to 50,000 pieces and the lead time can be as long as six months, and finally, pure custom circuits when the quantities involved are several hundred thousands. Of course, the customized arrays or the mass production diffusions will be provided by the MOS or bipolar plants; but they will not go beyond this. All the service aspects will remain the responsibility of DCS. The service will cover the design, simulation, and

generation of test programs if the user does not want to perform them himself. It will also cover the fabrication of mask generation tapes, circuit metallization and etching, as well as testing and packaging for small runs. The masks will be made at the St. Egreve plant, which is well equipped in this respect.

Five Families of Prediffused C-MOS's

Thomson-EFCIS's market studies show that 70 percent of the DCS activity will be oriented toward prediffused circuits. A large program aimed at creating arrays for all needs has been formulated. Technologically, these arrays will of course make use of the existing and future facilities of Thomsons-EFCIS' bipolar and MOS plants.

Three types of arrays are being studied: C-MOS, digital bipolar, and analog bipolar. C-MOS is currently the most advanced family, since it is the one that is most adaptable to short-term needs. This family is itself subdivided into five sub-families, depending on type of application: 3-17 V/15 ns aluminum grid for arrays to replace C-MOS 4000 installations; 5 micron, 3-12 V/10 ns silicon monolayer grid for circuits designed to replace TTL-LS logic circuits; 3.5 micron, 3-12 V/5 ns silicon monolayer grid to replace TTL-S circuits; 3.5 micron, 3-10 V/3-4 ns double layer silicon grid to replace 10K ECL-compatible TTL-S circuits; and finally, within two to three years, a double-layer silicon grid family, N-package, 2 micron, 3-10 V/2-3 ns, to replace 10K ECL assemblies.

Introduction dates have been set for the first two C-MOS families: two 144- and 300-cell, aluminum grid technology models have already been offered; they will be followed in June by a 120-cell model, in July by a 420-cell model, and in September by a 180-cell model.

In the 5-micron monolayer silicon grid technology, a 640-cell (1920 pairs of transistors) model will be offered in June, a 288-cell one in September, followed by 968 cells in October, 448 cells in November, and 192 cells in December. For these two families, users will be able to use a topologic and simulation catalog to design their own arrays.

Introduction of the first 3.5-micron silicon grid array is planned for November, with a model of about 1000 cells; the family will cover composites of 300 to 1500 cells. The introduction of the first 3.5-micron silicon grid with two layers of metallization, is in turn planned for May 1983, with a model integrating about 1400 cells. The family will cover 400- to 2200-cell circuits.

The first linear bipolar offering will be an array of 400 components, called polyuse, which has been used by the various divisions of the Thomson group for three years. In addition, DCS is currently working on the definition of a model known as 2 GHz (the transition frequency of the transistors obtained on an HF line available in St. Egreve), which will be used to implement circuits operating up to 600 MHz. This array should be introduced during 1983.

In digital bipolars, it will be decided between now and April whether DCS will make a second source ECL array from an existing array or an original ISL.

Lead times for obtaining the first 20 samples of customized prediffused devices will obviously depend on the services provided. For instance DCS will require two months to provide a design layout from circuit specifications if the user does not want to do it himself. Integration of the layout with mask design will require an additional month and one-half if DCS is assigned the task. Finally, fabrication of the 20 initial, good, tested, samples will require eight weeks after mask design, which is one of the shortest lead times available on the market.

For manufacturing, a period of three to four months can be expected for establishing final test programs, process specifications, and quality control. One hundred prototypes (not samples) will then be available for delivery.

Precharacterized C-MOS's in Late 1982

As we have seen, DCS will also offer catalog circuits (precharacterized circuits). The division has already established a catalog of about 40 standard TTL-LS cells based on the St. Egreve bipolar unit catalog. Late in 1982, an MOS and C-MOS catalog will be compiled based on the EFCIS MOS unit.

11,023
CSO: 3102/214

RTC DEVELOPS TRIANGULAR-CELL D-MOS TRANSISTOR

Paris ELECTRONIQUE ACTUALITES in French 19 Mar 82 p 16

[Article by J. P. Della Mussia]

[Text] RTC (Radiotechnique Compelec) just disclosed the structure characteristics of the D-MOS transistor that the company has been studying for several months. This structure is based on triangular cells (rather than hexagonal, as in the case of Siemens or IR); according to RTC, this would make it possible to reduce the output resistance of the D-MOS with respect to existing structures, thanks to "an optimization of the channel perimeter/useful area figure of merit."

From our own comparisons with the International Rectifier (IR) industrial devices, the reduction in output resistance obtained by RTC in their laboratories is of the order of 30 percent; this is a significant amount, which for a given power and voltage drop, can result in an equal 30 percent reduction in chip area. Such a reduction plays a very important role in manufacturing yields and therefore in costs (which can then be reduced by more than one-half). RTC could thus benefit from a non-negligible advantage when it decides to manufacture this device (the date has not yet been fixed), at least if the laboratory characteristics can be duplicated in industrial production, and if in the meantime the competition does not begin to sell improved versions of their current transistors.

100 V/0.15 ohm/9 mm-square D-MOS

The device presented by RTC for evaluation is a 9 mm-square D-MOS that can carry 100 V, with a typical series resistance of 0.15 ohms at 25 degrees C. Its characteristics are: 450 pf input capacitance, 200 pF output capacitance, 50 ns turn-on time, and 130 ns turn-off time. We compared these characteristics with those of its closest models in the IR line, namely the IRF 530 100 V/0.14 ohm typical/13.25 mm-square, and the IRF 520 100 V/0.25 ohm typical/8.04 mm-square.

In selecting a D-MOS model, the user first selects a power level and voltage drop at a given voltage. He thus selects a series resistance. In this case, the reference model must be the IRF 530, since its typical resistance is nearly equal to that of the RTC model: the gain in area is then nearly 30 percent. But the other characteristics, in particular for capacitances, are those of a 9 mm-square chip, and therefore very favorable for the RTC device. In particular, the typical input capacitance of the IRF 530 is 700 pF, and its output capacitance 300 pF. On the other hand, the response times of the IRF 530 are better overall than those of the RTC D-MOS: 80 ns for the turn-on time and 80 ns for turn-off time are typical. This is probably due to the very long channel required by the French design.

11,023
CSO: 3102/213

ELECTRONICS

FRENCH FIRMS EXHIBIT SEMICONDUCTOR MANUFACTURING EQUIPMENT

Paris ELECTRONIQUE ACTUALITES in French 19 Mar 82 pp 1, 21

[Article by JP Della Mussia]

[Text] Zurich--Semicon 82, the major European event for semiconductor equipment manufacturing, held this year from 9 to 11 March, will have been unquestionably marked by a strong French participation among the exhibitors. Their presence was all the more noteworthy since the equipment offered by Cameca, Euromask, CIT-Alcatel, and Riber, covered all the key elements in the semiconductor fabrication chain, with the exception of automatic welding machines.

Generally speaking, no startling announcement was made, the leaders in the field--most of them American--reserving their unveilings for Semicon/USA, which is held in May. The event attendance remains the same (4000 visitors in 1980, 3500 in 1981, and 4000 this year), but the number of exhibitors is still increasing: it reached 250 this year, after having passed the 200-mark last year. In terms of trends, progress seems to have stopped in two areas: after having indicated their interest in 5-inch wafers last year, users are finally ordering equipment for 4-inch wafers this year, to eventually become compatible with 5-inch material. On the other hand, interest in direct electron lithography on wafers has dropped, in favor of wafer steppers and 1/1 projection aligners, at least for the generations of HMOS II/III integrated circuits, which are the substance of current investments.

And finally, the last notable trend is that in recent years the Europeans have reacted to their weakness in fabrication equipment, and now offer many original machines.

Wafer Stepper Versus 1/1 Aligner

The great news therefore, at least for the French, was Euromask's (Matra Group) presentation of its first wafer stepper, right at the company's exhibit. This machine has elicited great interest, especially since the first unit is to be delivered in a few weeks. Cameca (Thomson-CSF) also showed (but only on displays) its first wafer stepper, in direct competition with Euromask's. The first unit should also be delivered in a few weeks, which will lead to sales arguments from both, undoubtedly leaving the eventual buyer in a quandary.

The task will be a difficult one for the two companies, since GCA, which is number one in the world in this field, is also preparing wafer steppers with characteristics similar to those of the two French companies. Moreover, Perkin Elmer, the spoil-sport of the gathering, presented its 1/1 projection aligners, the Microlign 300 and 500, which use a different and simpler principle than that of the other machines. They are appropriate and more powerful for producing very large quantities of H-MOS II or H-MOS III circuits.

From all these presentations, potential users concluded that for the short-term mass-production of H-MOS II circuits, the Perkin Elmer approach is the most tempting at face value. But all the bets are not in: all these machines must prove themselves, and the French companies stand a good chance if they maintain their specifications and lead times. To summarize or be realistic: for the French its either midnight oil or failure, at least on the international market.

The situation is different for CIT-Alcatel with its GIR 200 etching machine (see ELECTRONIQUE ACTUALITES, 4 December 1981). All the potential users showed a lot of interest, without reservation, at least for etching polycrystalline silicon, and potentially silica (the work on aluminum etching is not sufficiently advanced to judge). CIT-Alcatel thus has all the opportunity to satisfy many orders in 1983.

And finally, the French company Riber (division of Instruments SA) also exhibited at Semicon for the first time. The company is well known for its molecular beam epitaxy (MBE) machines since it covers 60 percent of the world market in this field. At present, MBE is used primarily for III-V compounds (GaAs type); it is also beginning to be used for II-VI compounds. Two groups in the world are now studying this process for application to silicon (Riber and Bell Labs). The principle should make it possible to obtain epitaxial layers of excellent quality at a cost which still remains to be determined. Production of these machines for silicon could hardly occur before one or two years.

Many other French companies exhibited at Semicon for the first time, but their equipment did not have the "key equipment" nature of the companies mentioned above.

11,023
CSO: 3102/214

ELECTRONICS

FRENCH LITHOGRAPHIC MASKING MACHINES CLAIMED BEST IN WORLD

Paris ELECTRONIQUE ACTUALITES in French 19 Mar 82 p 22

[Article by JPDM: "What Lithographic Masking for Tomorrow's Integrated Circuits?"]

[Text] Two technologies for lithographic masking machines are currently competing on the market for H-MOS II circuits, and to a lesser extent, for H-MOS III: wafer steppers, which so far are exclusively used for printing patterns up to 2.5 microns, and 1/1 projection maskers. The first type projects the photo of a mask at a scale of four or ten on the surface of a silicon slice 10x10 mm-square for instance, and repeats this photo several times to cover the surface of the slice. The second type uses a mask at a scale of one, and prints the slice in a single operation. Because it is difficult to improve the definition-times-covered field product for objectives, it is preferrable to reduce the field to obtain the best possible definition and precision in mask superimposition.

Which explains the market success of wafer steppers for H-MOS II circuits, where GCA is a world leader. The French companies Cameca and Euromask are also using this approach.

Perkin Elmer, on the other hand, has always been the world leader for 1/1 projection maskers, which are simpler and more rapid than wafer steppers, and which today are almost exclusively used for H-MOS I circuits. But as we have seen, optics cannot be rapidly improved both in definition/precision and field coverage. The company therefore had to push technology to the limit, particularly in resorting to far-ultraviolet, in order to meet the requirements of H-MOS II (these machines will undoubtedly be inadequate for H-MOS III because of superposition errors). As a result of their very simple principle, the 4- and 5-inch machines that are being introduced have an announced production rate (100 slices per hour) that is three times higher than that of current wafer steppers, and two times higher than that of the new generation wafer steppers. Moreover, they are 30-50 percent cheaper. They could therefore win the game if they keep their promises in automatic operation. But as we have mentioned, the technology is being pushed to its utmost limits, and all the results are not yet in.

Perkin Elmer is doing its best against the attacks of wafer stepper manufacturers: "Eventual dust on masks is reduced with wafer steppers, but it is still there"; "when you say 40 4-inch slices per hour, you actually do not go beyond 25, and even less, in automatic operation"; "slice planarity does play a certain role, but we have a system which measures local distortion and creates a variable magnification; in any case, you need very good substrates"; "our new 300 and 500 maskers have the advantage of compatibility with the models 200 that are found everywhere; yours don't." On the other hand, wafer stepper manufacturers point out that the 300 and 500 machines need masks of such high quality, that they have to be produced on an electronic masker. Perkin Elmer does not deny it, and in fact offers its own electronic masker (which costs 13 MF!). And finally, wafer stepper manufacturers stress that a local readjustment is performed before each exposure with their machines.

Cameca: 60 to 80 Slices per Hour

Cameca asserts that its ARW wafer stepper, the first unit of which will be delivered within a month to the Integrated Circuits Division of Thomson-CSF, is the fastest on the market: 60-80 four-inch slices per hour in automatic operation, for an area coverage of 10x10 mm-square (60/hour guaranteed). Cameca stresses that its machine does not require any time to be placed in operation, that it has a superposition error of 0.1 micron, a useful resolution of 1 micron (0.8 micron limit), and absolute alignment through the objective. The company explains that the speed of its machine derives from its powerful light source (1000 W), its superimposed grid alignment system, and its autofocus, which is performed by three pneumatic sensors independently of slice surface.

Cameca has launched the fabrication of five ARW wafer steppers, and envisages the production of 15 in 1983, thanks to an investment of 20 MF in its facilities. A small production unit will be created in parallel (the site has not been selected); it should begin operations by the end of 1983. While the short term production goal is reasonable, it becomes ambitious for 1986: 80 machines/year (at a cost of 3.5 to 4 MF each). Cameca is presently setting up a demonstration laboratory at Courbevoie, which should be ready at the end of 1982. (A temporary laboratory will be opened in Corbeville in April).

Euromask: Like Cameca

Euromask (99 percent Matra subsidiary) officially announced in Zurich its Eurostep 2000 wafer stepper. Although it uses completely different technologies, the announced specifications are alomst identical to those of the ARW: 50 slices/hour for 7x7 mm-square squares in automatic operation; useful resolution of 1-1.5 microns (0.7 microns over the entire field with careful alignment); 0.1 micron positioning increment. Euromask explains that the speed of its machine results from rapid table movement (the table is made of a composite and weighs only 12 kg), short exposure thanks to an original light source adapted to the objective, and a prealignment that is performed during exposure of the preceding slice. In addition, Euromask points out that the alignment microscope is integral to the field definition device; alignment is thus performed at each level, on new patterns if necessary, gaining 100 ms per operation. The Eurostep 2000 automatically changes its reticle in 3 seconds.

Three machines are being assembled and tested at Euromask. The first will be delivered to HMS, the second to CNET, and the third will be used by Euromask for evaluation. Orders are currently being taken for delivery next November. The industrial production phase will in fact begin in September, in a new plant in Maleville, near Nantes. The company's investment in machinery and buildings is of the order of 30 MF.

Euromask hopes to sell six machines (in addition to the three already produced) by the end of 1982; the production capability in 1983 will be 30 machines.

For the future, Euromask is working on a laser beam reticle generator which will be less expensive ($600,000) than an electronic masker. The world market would be 300 machines.

GCA: Toward 0.7 Microns

GCA is not idle either. The company has just raised the speed of its machine by 40 percent, by improving its light output and mechanisms, and hopes to raise it by 70 percent for the year 1982 as a whole. CGA vice-president Bill Tobey would rather not give definite figures because "there are too many parameters involved." The company is also working on improving definition. "The adoption of Zeiss optics with a magnification of four, will enable us to achieve a 1.1 micron definition for a 10x10 mm-square area. In 1983, we hope to reach 0.7 microns for 7x7 mm-square squares, with a magnification of ten." There are other wafer stepper manufacturers on the market, the best known being Optimetrix, and more recently, Philips and Censor.

11,023
CSO: 3102/215

RTC COMPETES FOR ULA MARKETS WITH LINE OF FAST ECL CIRCUITS

Paris ELECTRONIQUE ACTUALITES in French 5 Apr 82 p 20

[Article by J. P. Della Mussia: "RTC: Prediffused ECL Circuits Up To 2,200 Gates/ 0.35 NS"]

[Text] RTC [Radio Technique Compelec] has just announced a line of prediffused ECL [emitter coupled logic] circuits rated as among the world's highest-performing from the standpoint of speed, and certainly the one offering the best figure of merit. This line of cell arrays, called its ACE line, presently includes a 600-gate (24-cell) and a 900-gate (37-cell) model. A 1,400-gate (60-cell) version will be available in September, to be followed in the first quarter of 1983 by a 2,200-gate (100-cell) model, and 1 year from now by a 1,256-gate (48 cells plus a 256-bit RAM) model.

For all these arrays, the energy consumption per gate is 2 to 3 mW for a speed of 0.35 ns, resulting in a figure of merit of only 1 pJ [pico-Joule]. By comparison, a low-power 10-ns CMOS [complementary metal oxide semiconductor] consumes 100 μW per gate, for a figure of merit also equal to 1 pJ.

A Mushrooming Market

Contrary to predictions by the makers of prediffused devices who are locked into the CMOS, I^2L [integrated injection logic] and STL [Schottky transistor logic] technologies, the market for very fast prediffused ECL circuits should mushroom over the next few years, and essentially in the United States. This market is all the more attractive to ECL makers, in that there are so few of them worldwide as compared to manufacturers specializing in the slower technologies (Plessey, Ferranti, Siemens and RTC in Europe; essentially Motorola and Fairchild in the United States; mainly Hitachi, Fujitsu and NEC [Nippon Electric Company] in Japan).

Three market niches in particular are now opening up: In data processing, concurrently with the traditional CPU [central processing unit] market, the market for control of fast peripherals is developing; in instrumentation, three markets are opening up: That of acquisition probes for VLSI [very-large-scale integration] testers, that of high-speed oscilloscopy, and that of 16- or 32-channel logic analyzers.

Concurrently with the development of the foregoing markets in the United States, a telecommunications market will be opening up in Europe, and especially in Germany: That of TV-, stereo-, and other channel multiplexers whose bit rates will exceed 140 Mbits/sec, and the first uses of which are planned for the period 1983-1985. A fundamental change is thus taking place for ECL circuits, in that large computers will no longer provide, in the future, the principal market for very fast prediffused circuits.

Although the world market for ECL memories is currently dominated, to the extent of 45 percent, by Japanese companies (unfortunately for Fairchild, RTC and Motorola, this share is likely to increase even more in coming years), the Japanese presence in prediffused circuits is still not being very strongly felt, since their best prediffused circuits are going to captive demand and are therefore, for all practical purposes, not readily available on the market. Thus the Japanese have available for their own needs gate arrays with propagation times of 0.3 and 0.4 ns and a complexity of 400 to 500 gates, as well as 1,000-gate/0.5- to 0.6-ns arrays with memory on the chip for special applications.

In any case, those are gate arrays, not cell arrays. In regard to the latter type of array, which is characterized by low energy consumption and ease of customizing, the Japanese are still lagging; RTC can therefore count on a certain sheltered grace period, the more so since this company's Subilo P and Subilo N processes are well suited to the cell technology.

Motorola, RTC and Fairchild thus currently share among them most of the largest world market, namely, that of the United States. Motorola is currently offering its Macrocell I, of the cell type, internal ECL (CML [current mode logic] at RTC) and compatible 10 k ECL. The ACE 900 and the ACE 1400 can easily replace the equivalent Motorola circuits (the inverse does not hold true), but it is more to the point to compare these products under development with Motorola's future Macrocell II circuits, the characteristics of which are not yet fully known, other than their internal speed of 0.5 ns and their maximum complexity of 2,500 gates.

The Fairchild company has all the technological know-how required to do as well as RTC, but is poorly positioned as regards prediffused devices (although well positioned with respect to ECL memories). Fairchild has made several attempts these last few years, but until now has disclosed only plans as regards advanced circuits.

The Assets Needed to Succeed

In this context, RTC's ACE family appears to have many of the assets needed to succeed.

It is a family of prediffused cell arrays, not gate arrays. The cell concept, as we know, lends itself to design in two stages: Choice of the function to be performed by each cell, to begin with; then, the cell interconnections needed to actualize the desired system. The cell configuration offers the advantages of

a good figure of merit (a gain of 5 to 40 over an ECL array for the ACE family) and a wide-ranging flexibility of design, in that function sites are preset on the silicon by way of function libraries. The client thus need only be supplied with simple software to enable him to design his own system and he can customize a circuit in 15 days including definition of the masks.

Gate arrays are not faster than cell arrays but they permit much finer-tuned optimizations of chip area and internal propagation times (although the logic paths must be calculated at around "50 ps"). This is why state-of-the-art data processing sometimes prefers gate arrays.

Another advantage of the ACE line is that its peripheral stages can be configured, by masking, as input, output or input-output stages. This is a desirable feature, especially with respect to multiplexing. The current 24- and 36-cell arrays have an input-only peripheral axis and another axis that is configurable as an input, an output, or a bidirectional one. These arrays are actually versions of the company's old MLA 24 and 36 circuits with redesigned peripheries to obtain the above-mentioned properties as well as 10 K and 100k compatibilities.

Another option available to the client is ECL 10 k or ECL 100 k output compatibility, it being understood that the circuit cores are in all cases of the CML type because of this logic's advantageous figure of merit.

Lastly, the client has the option of choosing from among output circuit speeds of 0.75 ns, 1 ns or 1.2 ns, all programmable by masking. It must be remembered that it is not advisable to merely request the maximum available speed for each peripheral output, as there is the chance that this might give rise to reflections and bouncing at printed circuit levels. It is preferable to use maximum clock speed, for example, and slower fronts for the other signals.

Another advantage of the ACE line is that each cell can be commanded in three states, enabling disconnects along a common bus, for example, thus avoiding perturbations. Command is effected by operating on the transistor emitters.

Up to 400 MHz

The other advantages are in the performance domain: The first of these is the line's internal propagation speed of 0.35 ns, which is of interest to the most demanding users requiring, as a rule, speeds of less than 0.5 ns (for a divider-configured flio-flop, the input signal frequency can be as high as 400 MHz). This is owing to the company's Subilo P technology.

The figure of merit (the product of propagation time and a gate's energy consumption) does not exceed, as we have pointed out, 1 pJ. This is largely owing to the use of three levels of current switching in ACE circuits in lieu of the customary two. But the figure of merit per gate is also bettered as the scale of the circuit is increased, since in all integrated circuits it is the peripheral stages that consume the most energy. The CML internal circuits used in the ACE line moreover have a good figure of merit.

RTC further points out that its new family averages a fill factor of 70 to 90 percent, a performance that can hardly be equalled at present by competing prediffused circuits, because of dissipation problems in particular.

The 1,256-gate array will have, as we have seen, 256 RAM memory dots and 48 cells. This structure is especially suited to ALU [arithmetic logic unit]-related functions, but also, in instrumentation, to the acquisition of fast data sequences that can subsequently be processed by a slower MOS microprocessor. The ACE 600 and 900 require chip areas of 28 and 36 mm^2 respectively; these areas will be reduced by 40 percent in the near future. The ACE 2200 requires a chip area of 80 mm^2; the production yield is nonetheless satisfactory, since the density of the circuits it carries is relatively low. Later, if justified by demand, a 5,000-gate array will be developed.

ACE circuits are offered in 64-pin housings for the 600 and 900 versions, and in a 120-pin housing for the others. A 144-pin housing is under study, but for sufficiently large orders, any housing can be provided. Energy consumptions are as follows: ACE 600: 1.8 W; ACE 900: 2.3 W; ACE 1400: 3.5 W; ACE 2200: 5 W; ACE 1256: 3.5 W. Consumption thus averages between 2 and 3 mW per gate. By comparison, a standard ECL 100 k gate consumes 40 mW.

The ACE family currently has no second source, but negotiations are under way in this regard in the United States.

We note that, in 1981, RTC sold 40 percent of its ECL circuit production on the European market (mainly the French market, with its HCML line for the CII-HB), and 60 percent on the American market. In 1982, RTC expects to cover 30 percent of the noncaptive world market, all ECL circuits included.

9399
CSO: 3102/255

FERRANTI ENLARGES FAMILY OF GATE ARRAYS

Paris ELECTRONIQUE ACTUALITES in French 5 Apr 82 p 21

[Article by J. P. Della Mussia: "Ferranti Enlarges Its Line of Prediffused CML/2.5 NS Circuits"]

[Text] Ferranti, which is represented in France by ATAC Diffusion in all that concerns prediffused circuits, is enlarging considerably its catalog of CML [current mode logic] circuits using the CDI [collector diffusion isolation] technology (a technology in which the company specializes, which yields a good figure of merit, but which is suited to operating potentials of over 7 V).

This enlargement will be along three axes: The first family, designated "R/LSI," consists of 5 matrices of 500 to 2,000 gates, 2 inputs. It has been available for only a few weeks on a new-studies basis; the actualization of prototypes will be possible beginning in the second quarter of this year, and production could start by the third or fourth quarter 1982.

The second family, designated "R/VLSI," consists of two 2.5-ns, 300 μW per gate models, one of which is a 4,000-gate and the other a 10,000-gate version.

The first of these will be available on a new-studies basis by mid-1982 and the second by the end of 1982.

The third family, designated "R/subnanosecond," will consist of three models: A 1,000- , a 2,000- , and a 4,000-gate model, the first of these offering an internal speed of 0.5 ns with an energy consumption of 1.5 mW per gate, and the other 1 ns at 0.7 mW per gate. These circuits will be available for new studies by the end of 1982; the first prototypes could be made available by mid-1983.

Choice of Three Speeds

The above-mentioned first five matrices of the R/LSI series can be actualized on the basis of three speed-consumption tradeoffs. In the "high-speed" version, the delay is 2.5 ns for a consumption of 300 μW per gate. In the standard option, it goes to 7.5 ns at 100 μW per gate, and in the low-power version to 15 ns at 30 μW per gate.

The family includes models as follows: 224 cells/500 gates/40 outputs; 378 cells/900 gates/48 outputs; 504 cells/1,200 gates/56 outputs; 672 cells/1,600 gates/64 outputs; and 900 cells/2,000 gates/72 outputs.

As usual, it is difficult to compare the integration possibilities of these circuits with those of competing families without knowing how many gates or how many cells are taken up by the basic functions.

The cells of the Ferranti matrices are equivalent to 2 NOR gates, 2 inputs, and provide two electrically isolated buffer outputs. Each cell thus has 4 current sources: An elementary gate needs one source of current for its CML portion and another source for the emitter-follower buffer. It may be desirable to assign two current sources to the CML gate and to the emitter follower; the cell, in this case, can only contain a single 4-input gate at maximum, and the delay will be approximately equal to half its normal nominal value (without, however, ever being less than 2 ns). Thus, for a 7-gate load, for example, the delay for a falling front is reduced from 8 ns to 4 ns.

Ferranti also points out that with a wired OU [output unit] the response times and the number of necessary cells can be diminished.

For example, an exclusive OU occupies 1.5 cells in a Ferranti array; an RS flip-flop 1 cell; a latch with return to zero 2 cells; a D flip-flop 3 cells; a JK flip-flop 5.5 cells; an asynchronous divider by 10, 14 cells; and a cascadable D-sychronous binary counter 7.5 cells.

A library of standard interface circuits is in the process of being drawn up.

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CSO: 3102/255

ERRATUM: This article is republished from JPRS 80906 of 26 May 1982 No 104 of this series, pp 1-2 to correct certain translation terms.

ELECTRONICS

ERRATUM: CIT-ALCATEL ENTERS CUSTOMIZED CIRCUIT MARKET

Paris ELECTRONIQUE INDUSTRIELLE in French 1 Feb 82 pp 19-20

[Article: "Alcatel Semiconductors Comes on the Scene"]

[Text] CIT-Alcatel recently gained a foothold on the market for customized circuits by creating, several months ago, Semiconductors Alcatel (SCA) following an agreement made 20 January 1981 by which it acquired 25 percent of the capital of the American company SPI (Semi Processes, Inc).

SCA, whose main interest is customized printed circuits, pure or in the form of gate arrays, has left little room in its plans for standard printed circuits: The resale of SPI's standard DMOS circuits will account for only Fr 3 million of the Fr 28 million of turnover planned for 1983, and Fr 17 million of the FR 87 million planned for 1985. SCA will study and design circuits in all technologies, but will distribute only CMOS and will subcontract other technologies at this level.

Indeed, the interest of the CIT-Alcatel-SPI agreement seems to be primarily technological in nature, since SCA is in fact using CMOS technology with 5-micron selective oxidation on SPI gate array matrices with 300, 544 and 1,000 gates, programmable by a single metallization mask. The resulting characteristics of this technology are (typical) internal propagation times of 3 to 5 nanoseconds, input of 3 to 12 volts, and a fan out of 2. This year SPI should bring out matrices with 3-micron patterns and with two levels of interconnections, but should not be followed by SCA in this field before 1984. This is for financial (and also technological) reasons. Since the designing has already started in Villarceaux, near Paris, the rest (masks, diffusion, etching) could begin this year at the neighboring Marcoussis center, originally earmarked for ECL circuits and high-reliability HF transistors; the manufacture of wafers, handled up to present by SPI in the United States, will be performed in France, in late 1983, in a new plant in Aix-les-Bains, the capacity of which should ultimately reach 1,000 four-inch wafers per week. In terms of design, the Villarceaux center is now capable of accepting 100 gate array projects a year (half for the group's needs).

The gate array prototypes will be delivered to the user between 6 and 14 weeks after the plan is submitted and production could begin within 8 weeks after the delivery of the prototype. Finally, in order better to understand this

infatuation of CIT-Alcatel (and so many others), with customized circuits, we note the company's estimates concerning the customized MOS circuit market, as follows: In 1983 the market in Europe would be Fr 2.5 billion and should increase to Fr 3.2 billion in 1985. In France the market for gate arrays alone would go from Fr 113 million to Fr 254 million for the same years, respectively.

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CSO: 3102/196

ERRATUM: This article is republished from JPRS 80906 of 26 May 1982 No 104 of this series, pp 3-4 to correct certain translation terms.

ELECTRONICS

ERRATUM: EEC TO FUND R&D IN INTEGRATED CIRCUIT MANUFACTURING MACHINES

Paris INDUSTRIES & TECHNIQUES in French 10 Feb 82 p 14

[Article by Jean-Francois Desclaux: "Integrated Circuits: A European 'Machine Plan'"]

[Text] Breaking the Virtual U.S. Monopoly by 1985

True independence with respect to integrated circuits presupposes two things: mastering the basic technologies and design capabilities, but also having one's own manufacturing machines. The United States is the only, or almost the only, country in this position. The European Community wants to break up this virtual monopoly. It is rallying its forces to give itself equipment capable of satisfying the objectives of the next 5 to 10 years: attaining submicronic technologies. Adopted by the EEC Council of Ministers, a "regulation" which provides for the construction of a wafer stepper between now and mid-1984 has just entered into force. The machine will have to handle 6-inch wafers, with an exposure field of 1 cm^2 and with a line-etching precision of 1.25 microns. The output will have to be about 50 four-inch wafers per hour.

Electronic maskers will have to inscribe 1-micron lines on 15 to 20 six-inch wafers an hour. The precision of alignment will reach 0.1 micron for minimum characters of 0.5 micron.

Plasma-etching equipment is defined in terms of the materials etched: doped silica, silicon nitride, polycrystalline silicon, silicides, aluminum, metals used for interconnection and resins. The performances will be on the same order as those of other links in the manufacturing chain: 1.5 micron lines and outputs of 50 wafers per hour. The community will provide 50 percent financing for projects for researching and developing manufacturing machines. These machines also include test machines and CAD machines for designing integrated circuits in the new technologies. Thus this equipment should be built by the expiration of this plan, set for 31 December 1985. It has been noted, however, that certain research centers plan to cross the micronic threshold about 1983 and accordingly they need these machines here and now.

Two Hundred and Fifty Million Francs

Funds equivalent to approximately Fr 250 million will be granted to European companies capable of meeting the specifications set more or less provisionally

by this regulation. In fact, since they date from 1980, these specifications require some updating and are still likely to be changed following the development of the first contracts planned for the end of 1982. The invitations for bids will be published shortly in the official journal of the European Community and will be addressed to established industries in the community.

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CSO: 3102/196

BRIEFS

SGS-ATES, TOSHIBA C-MOS AGREEMENT--SGS-ATES and Toshiba have just signed a technical "cooperation" agreement designed to bolster the position of SGS-ATES in the area of C-MOS circuits. All that is known at this point is that SGS-ATES will receive the know-how necessary for two 3-micron-pattern C-MOS fabrication processes, and that the company will be able to produce all the C-MOS circuits in the Toshiba line. (This line covers C-MOS static memories, microprocessors, prediffused devices, and original logic circuits). Tuesday evening, SGS-ATES was still not in a position to provide the list of products which would be selected for mass production in Italy. Nor did the company want to reveal anything about the two technologies in question (N-MOS circuits are excluded from the agreement). Finally, there was no comment either on the nature of the agreement (acquisition of licences, or anything else), or on the investments being considered by SGS-ATES for this new operation and for the fabrication dates of the new products. It is therefore difficult to assess the significance of the agreement. There is no doubt that at present, Toshiba has one of the best, if not the best C-MOS technology in the world, at least at the 3-micron level. But will SGS-ATES enjoy the benefit of succeeding 2-micron and smaller technologies? By the time SGS-ATES is ready to produce 3-micron circuits, the industry will indeed have started to produce 2-micron ones. Finally, it must be noted that SGS-ATES is the first company in Europe to sign an agreement of this type with a Japanese company. When the first French integrated circuit plan was being prepared, negotiations did take place between French and Japanese companies, but it might as well be acknowledged now that the goal was essentially to reduce the demands of potential American partners. World leadership in semiconductors has shifted since that time. [Text] [Paris ELECTRONIQUE ACTUALITES in French 26 Feb 82 pp 1, 14] 11,023

CSO: 3102/213

FIRST FRENCH FLEXIBLE WORKSHOP PLACED INTO SERVICE

Paris ELECTRONIQUE ACTUALITES in French 7 May 82 pp 1,7

[Article by G. Bidal: "At Renault Industrial Vehicles, the First French Flexible Workshop Is Placed Into Service"]

[Text] Saint-Etienne--The first French flexible workshop was inaugurated on Monday 3 May at Boutheon, near Saint-Etienne, at the Renault Industrial Vehicles plant where truck transmissions are made. This realization, especially the fact that the workshop is controlled in actual real time, is probably a world first; therefore, it marks an important date for French automation, even though very few enterprises can afford such a top-of-the-line workshop.

This inauguration is providing French chauvinists with a unique opportunity to rejoice and shout: "We do have a flexible workshop!" Although this realization alone cannot make up for the fact that France is behind when it comes to automated workshops, it should rid the French automation industry of the technical complexes it might still harbor.

It must be recognized that, beyond the almost magical connotation which the phrase "flexible workshop" has acquired, the Boutheon machining unit for heavy-duty truck transmission casings is impressive. Judge for yourself: to machine four different types of parts, one in aluminum and three in cast iron, each including some ten secondary variations, the workshop is outfitted with seven digital control machines with automatic tool-changers: four Grafenstaden machining centers, two convertible modular machines (MMC's) and one boring-surfacing machine manufactured by SMC[expansion unknown]-Renault who was the prime contractor for the workshop. All these machines are served without any operator's intervention by eight motorized trucks guided through wires which are embedded in the floor; these trucks were made by SEIV[expansion unknown]-Automation, another subsidiary of Renault Machine Tools. This conveying system is based on a grid network which is bidirectional in all points; it is of the "taxi" type: any truck, receiving its orders through magnetic contacts distributed along the network, can transport "on request" any part along any path from one machine to another. The truck batteries are also changed automatically. The software for the transportation system was designed and realized by SODETEG [Technical Studies and General Enterprise Company].

Real-Time Control: A World First

Above all, the central control system can be considered as a world first, especially so since it operates entirely in real time. This means that each momentary event will reset the decision-making parameters, either locally or centrally (attribution of any operation to be carried out on any part supplied by any truck to any machine). It is easy to imagine the complexity of the mathematical operating model; still, the central management system installed by CERCI [expansion unknown] is surprising light: one Solar 16-40 with 128 K of memory from SEMS [expansion unknown] (with a duplicate for safety reasons). It should be noted that intelligence has been widely distributed: the system includes 25 SMC [expansion unknown] top-of-the-line programmable controllers (models 200 and 500) and 5 NUM [expansion unknown] digital controls.

Flexibility, here, should be understood in the broadest sense: flexibility as far as volume is concerned; the present investment provides for 70 casing collections per day (25 are produced today), and next year an additional investment will increase that number to 100 per day. Flexibility as far as production is concerned, since the numerous changes in production introduced after the order was placed (1979) "got through" nicely. Renault Industrial Vehicles has published an invitation for tenders for the industrialization of an additional part in the same workshop, and it is likely that Renault Machine Tools will be the successful bidder. Finally, we should mention flexibility as far as breakdowns are concerned, since the parts can be machined on either of two machining units, and since these machining units can carry out the work of the other machines, although with a slower output rate.

Forty-Five Million Francs Invested

For this first French flexible workshop, therefore, the very top-of-the-line has systematically been chosen. There remains to assess the cost, for Renault Industrial Vehicles denies that this was part of a technological pilot experiment within Renault. The project was compared with other, less flexible solutions--transfer lines or flexible cells located along a batch conveying system--and was selected because of its "strategic" profitability (it can adapt qualitatively and quantitatively to future demand). Certainly, it represents a considerable investment: 45 million francs at 1979 prices (including 6 million francs in assistance from DIELI [Bureau of Electronics and Data Processing Industry] in the form of bonus loans); this amount does not include overall research investments. Nevertheless, the solution is financially competitive for Renault Industrial Vehicles; 15 people--3 shifts of 5--are enough to ensure normal operation of the workshop, and the operating costs are slightly less than with a traditional solution, although maintenance costs are higher. The decisive advantage, however, resides in the adaptability of this tool to the market, and has not yet been measured.

Other Clients

At Renault Machine Tools, the supplier, it is expected that this first will bring in other contracts and numerous contacts are rumored to be taking place, both in France and abroad, to study other flexible workshops. Two contracts

have been obtained, one from Caterpillar in Grenoble, the other from the landing gear manufacturer Messier-Hispano-Bugatti. These projects, however, will be smaller than the Boutheon workshop since they will use a linear conveying system. But they show what few sectors are likely to be interested in an automated workshop of the Boutheon type: earth-moving equipment, aeronautical industry, industrial vehicles. Apart from these, the large investments required will probably place such a workshop out of reach of the industries most likely to be interested: small and medium-size industries producing small series. Obviously, Renault Machine Tools wish to derive from this experiment flexible solutions suitable for a broader market, but they still must prove that "he who can do most can also do less."

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CSO: 3102/279

RENAULT PATTERN RECOGNITION SYSTEM NOW ON PRODUCTION LINE

Paris LE MONDE in French 14 Apr 82 p 14

[Article by Richard Clavaud: "A New 'First' at Renault"]

[Text] After having opened France's most robotized plant at Douai-Nord--where the R-9 car is built--Renault recently achieved another "first" in its plant at Cleon in Seine Maritime,* where a few weeks ago, a robot-equipped pattern recognition system was incorporated into an industrial production line. Housed inside a grillwork cage a few meters square, this robot, manufactured by Renault-Acma, unloads crankshafts for the R-5 and R-18 cars and places them into a transfer machine. These crankshafts weigh an average of 18 kilograms. They are stacked on two pallets positioned on both sides of the robot. The robot's "hand" grasps each crankshaft and places it on a V-shaped rack which, in turn, sets it down on the conveyor belt. When the robot has finished unloading one pallet, it moves to the other. At the same time, a signal light informs the fork-lift truck operator that he has 45 minutes--the time it takes the robot to unload a pallet holding 108 crankshafts--to bring in another full pallet.

The robot unloads one crankshaft approximately every 20 seconds, but it can work faster. This permits, for example, constitution of a "buffer stock" on the conveyor so as not to leave the transfer machine waiting for parts when the robot has to be shut down, which is the case when the fork-lift operator moves a new pallet in place.

Before this robotics system was installed, it took three workers to keep the transfer machine loaded. They handled several tons of metal per day. Removing crankshifts from the pallets was hard work for these men. But it was a simple task. For a robot, the task is extremely complicated. Officials of Renault's DTAA (Advanced Automation Techniques Directorate) told us that simple manipulators would not have been adequate for this automation. The position of the crankshafts on the pallet may vary by a dozen centimeters and their orientation by some 15 degrees. Furthermore, their direction is not defined beforehand. The robot must, therefore, show a certain degree of "intelligence" to adjust itself to this environment.

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* The Cleon plant produces two-thirds of the engines used by Renault and all mechanical transmissions. Its daily output is 4,600 engines and 6,500 transmissions.

Several Stages

Renault recently exhibited a robot of the same type at the Palais de la Decouverte [a museum of science and technology]. This robot was shown picking up a randomly-positioned part lying on a flat surface. At Cleon, the task is even more complex in that the robot is working in an industrial plant and has to grasp one item from a semi-jumbled stack. The pattern recognition system must not merely identify an object on a uniform background, but also single it out from all identical objects lying alongside it and beneath it in layers, all of them forming a background of the same color.

The pattern recognition process has several phases. An overhead TV camera mounted above the stack of crankshafts transmits an image to a computer which marks it with a series of conspicuous dots framing the ends of the parts. To ascertain whether these ends could be those of a crankshaft, the computer measures the distance between them and also their orientation. Along a line connecting two "recognized" ends, the computer then analyzes the alternating bright and dark areas that correspond to the "hollows" and "bulges" on a crankshaft.

If this alternating pattern matches the pattern of the crankshaft silhouette stored in the computer's memory, the test is deemed positive. The computer then finds the crankshaft's center of gravity and a sonar mounted in the robot's hand determines the height above the stack. The robot thus has all the data needed to grab the crankshaft.

Motion-Picture Set Atmosphere

Adjusting this system for use in an industrial plant required 6 months of work by Renault engineers. One of the problems that had to be resolved was that of the cameras. After tests with equipment produced by Philips, the engineers finally selected equipment proposed by Thomson. The latter firm succeeded in producing satisfactory results by modifying its standard 256-line industrial cameras.

Then the lighting problem had to be settled. Renault had initially tried to work in natural light. But as the seasons changed, the rays of sunlight entered the plant through different skylights, a situation which made calculations difficult. Consequently this approach was abandoned. Now the lighting is furnished by six 250-watt spotlights that create a sort of motion-picture set atmosphere.

DTAA executives underscored the importance of prehension problems. "Just as in assembly operations it is not enough to know how to insert one part into another to actually put them together, in our case it is not enough for the robot to know how to recognize a crankshaft to actually handle that crankshaft. In these two applications of robotics, the robot has to be able to grasp a part that has a complex shape." The pincers-like hand used at Cleon is "compensated" thus giving it some play. It does not close until one of its jaws has touched the object to be grasped, thus allowing a positioning accuracy of a few millimeters while avoiding any inordinate shaking of the stack of crankshafts.

This system has long been used by mechanical engineers. It requires no electronic circuits and provides an economical solution to one of the robot's dilemmas, namely how to make a pincers that has a certain flexibility while still retaining a high level of precision.

The Cleon robot appears to be operating efficiently. According to plant and DTAA officials, its current failure rate is only 0.5 percent and is expected to drop to 0.2 or 0.1 percent. Andre Lavarde, the Cleon plant's public relations officer, stressed the industrial character of the robot operation: "In this plant, we replace men with machines only when such action is economically viable."

The Cleon plant is expected to announce other innovations shortly, including installation of a tridimensional measuring machine. Automatic inspection and testing of parts will thus be an integral part of the manufacturing process.

Renault has once again demonstrated that it is capable of solving its own automation problems without waiting for the results of government research programs which the company feels have less and less connection with industrial reality. As a DTAA executive explained: "Government research laboratories have an eternity in which to do their work. Unlike them, we have a problem to resolve every day, namely how to develop in-house robots with which to build automobiles."

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CSO: 3102/258

PROCESS FOR MAKING CERAMIC PARTS IN MOLDS

Paris INDUSTRIE & TECHNIQUE in French 10 Feb 82 p 78

/Article by Lucien Martin: "Electro-Molded Ceramics: Now, Direct Molding"/

/Text/ The melted ceramic material is drawn into the mold. The time it remains therein determines the thickness of the piece.

Alumina, silica, and zirconia based ceramic materials melt at temperatures over 1750 C. They are distinguished by remarkable pressure and abrasion resistance and by their refractory properties.

Industrial production of pieces requires the use of ovens capable of functioning at approximately 2000 C. Ceramic materials are most often poured in large masses (0.60 x 1 x 2 m, for example), then cut into pieces of desired shape and dimensions. The dimension of those blocks permits slow cooling resulting in suitable crystallization; subsequent cutting proves long, difficult, and costly.

Moreover, direct molding encounters difficulties related to the resistance of the mold, and to the nature of the binder, which imperatively must be non-reducing. Mechanical resistance remains weak at filling, either by pouring or aspiration. Because of these various limitations, high-temperature molded pieces of small size or complicated shape are not widespread.

Related to molding by aspiration, the process perfected by J. Le Clerc de Bussy reconciles the advantages of direct pouring, with a short and rectilinear feed conduit, and those of bottom pouring guaranteeing smooth entry of the liquid into the mold. Transfer of the pulverulent material above the fusion bath is assured by a boost pressure of air in the mold while the feed conduit pierces the layer, which leads to an appreciable reduction of heat losses. In that manner hollow shapes may easily be obtained, with constant or variable wall thickness, and to mold a great variety of objects such as tubes, casings, and refractory crucibles and flues of very diverse forms and dimensions. When the items to be manufactured are relatively small, however, it is advantageous to pour by clusters, and at times to include the molding of other and larger pieces so as to benefit from greater thermal inertia at crystallization. Makers and large users of insulators, who utilize these ceramics, are directly concerned in this method of production, which makes it possible to obtain finished

pieces with appreciable reduction of raw material losses, of subsequent finishing after pouring, and of energy consumption.

The fusion bed, maintained by a constant flow of the preparation to be cast, is still and constitutes an effective dome, with an oven thickness of 15 to 20 mm. The porous mold, placed in an impervious bell connected to an aspirator, has in its lower portion a feed tube with a pressure blower. Appropriate means of remote control allow the tube to traverse the bed and reach the liquid bath to a depth of approximately 10 cm. Then a suitable depression allows the liquid to penetrate the mold. It is then possible to allow the product to solidify in the tube in order to obturate it, or, to obtain hollow pieces, to allow a portion of the aspirated material not yet solidified in the mold to flow back down, while a certain quantity is already affixed to the walls. In addition, by using high pressure, some material can be pulverized on the inner surface of the mold.

In the electric oven, three molybdenum or tungsten electrodes convey energy to the center. Their position directs convection currents upward near the axis of the oven. Fusion occurs near the surface, and the bulb of melted material which forms around the electrodes does not reach the vessel wall, which is made of copper and refrigerated by a cluster of tubes.

The molds must momentarily resist very high temperatures, have sufficient porous and insulating properties to allow slow cooling, and contain no organic matter, so as to retain an oxidizing atmosphere.

In every case it is preferable that the mold be surrounded by an external metal grating to increase its resistance to hydrostatic pressure. The base, of the same material as the mold, has a connecting piece which links the interior void of the mold to that of the feed channel. The whole is supported by a metal collar insulated by a layer of Kieselguhr allowing slow cooling after molding. A spring on the upper portion constantly maintains pressure on the cover, with the mold at the base.

The entire unit is placed in a removable impervious chamber connected to vacuum and pressurized gas piping.

A Balance Monitors Filling

Once the mold is filled, it suffices to maintain the system in place and under depression for a few moments so that the liquid settles in the feed conduit, which occurs rapidly as soon as circulation is interrupted. Filling of the mold is monitored by a balance which indicates the weight of the chamber, mold, and aspirated material.

After molding, cooling is continued outside the oven to the point of complete solidification and return to a temperature allowing disassembly. Meanwhile, the chamber can be charged with another casing containing a mold to carry out a new operation. The feed conduit is formed by two removable pieces with truncated conical interior sections, joined at the point of minimal cross-section. Disassembly of two pieces permits breaking of the neck within the

conduit into two parts easily separable from the corresponding pieces.

The same materials can be used for hollow products, provided descent of the liquid is facilitated by suppression of the lid. Indeed, by interrupting the filling of the mold at the desired height, the excess liquid is made to flow towards the bath, leaving a solidified layer on the walls of the mold.

6145
CSO: 3102/197

HEAD OF AEROSPATIALE AIRCRAFT DIVISION ON ATR 42 PROJECT

Paris L'AERONAUTIQUE ET L'ASTRONAUTIQUE in French No 93, 1982-2 pp 19-22

[Paper delivered by Andre Etesse, Manager of Aerospatiale Aircraft Division, at a meeting of the Aeronautical and Astronautical Association of France and of the Association of Flying Aviation Professionals: "The Start of the ATR 42 Project and its Consequences"; date and place not specified]

[Text] I assume that you are interested not only in figures--you can find them in any good documentation--but in hearing a "story" and, if possible, a somewhat different story!

I have known different ways of launching a new aircraft: for instance, to build it, introduce it on the market, and find out that, contrary to all expectations, you could sell 500 units... but that was in the 1960's! Of course, if you consider the ever larger amounts now required to develop an aircraft, start a production run, and market it, nobody is willing to take such risks today.

Not only the "lenders" (government, banks, company boards) want to be convinced--and that is an understatement--but in practice you have to team up, to "cooperate" as they say, in order to share the risks with others and spread the commercial basis.

Finally, if we consider that the number of outlets is shrinking, i.e. the competition is increasing, we can see that it is not all roses today for the manufacturer who accepts such a challenge.

Let us now see how the Aerospatiale Aircraft Division was induced to launch a 40-50 seat twin turboprop successively called AS 30, then AS 35, then ATR 42.

On a previous occasion, I said that our approach was exemplary, for it was the Marketing Division who detected the need, and a preliminary project that could be "sold" both to the clients and to the financial departments was the result of a closely argued discussion with the Technical Division and with the production organizations in charge of working out the cost.

It was all the result of our failure, late in 1977, to revive the N.262, a 29-seat twin turboprop for which there was a large demand; for lack of credits,

we could not relaunch it and our teams started to look the world over to find out what kind of aircraft could take advantage of all the progress accomplished 20 years later--you know that aircraft technology progresses extremely fast--and, above all, could find enough buyers.

We were lucky enough to have direct access to the U.S. "commuter" market, since 26 N.262 were already in service to the greatest satisfaction of the users.

But the reason underlying our interest in such a formula was, and will remain for many years, the absolute necessity to improve fuel efficiency, either directly by using new "frugal" engines, or indirectly by improving cell design; this is where the selection of a turboprop came in.

First, we must say that, between 1970 and 1980, the cost of fuel has increased from 10 to 32 percent of the direct operating cost.

During the period 1978-1980 and, we must say, thanks to the understanding of the successive directors of civilian programs at the Ministry of Transportation, Messrs Guibe and Tenenbaum, and thanks also to research credits from our company, our Marketing Division was able to carry out reiterated in-depth market studies, and the Technical Division to meet the demand.

At the exact same time, cost studies, often accompanied with partial realizations, enabled us to determine the cost price of such an aircraft and whether we could sell it without getting in the red.

I shall spare you an account of the ups and downs of this venture in which, little by little, all our departments found themselves engaged with a fierce determination to succeed; the motto of our General Management and of Public Authorities was just one sentence:

/"Prove that there is an adequate market and that you can get positive results."/ [in boldface]

This is what has since then been called "intrinsic merits," as opposed to all repercussions which were then called "secondary merits," although they are now considered to be significant; I must briefly mention them now although, strictly speaking, they were not taken into consideration when the decision to launch the project was made.

First, in view of our position in the Airbus projects (medium capacity commercial aircraft equipped with reactors), we had to enter the field of modern propeller turboprops which would give us access to the 40-100 seat aircraft market offering a non-negligible military transportation component (Transall).

Also, we wanted our Aircraft Division--60 percent of the activity of which is represented by its large participation in the Airbus projects--to be able to carry out a global approach to a project even if, at a time, we had chosen to share this task with Aeritalia. It should be noted that, in turn, the creation of new teams, especially commercial teams, enabled us to improve our contribution to the Airbus projects.

Weights and Loads	ATR 42-100	ATR 42-200
Maximum take-off weight	14,715 kg	15,550 kg
Maximum landing weight	14,420 kg	15,240 kg
Maximum zero-fuel weight	14,105 kg	14,772 kg
Operational empty weight	9,296 kg	9,336 kg
Payload	4,809 kg	4,809 kg
Maximum fuel weight	4,500 kg	4,500 kg

Performances (under standard conditions and maximum weight)

Maximum operating speed	Mach 0.55/463 km/h	
Maximum cruising speed	513 kg/h	509 km/h
Maximum crusing altitude	7,620 m	7,620 m
Single-engine ceiling (97 percent of maximum weight, ISA [International Standard Atmosphere] + 10°C)	4,085 m	3,475 m
Balanced take-off distance (Z = 0, ISA)	950 m	1,100 m
Balanced take-off distance (Z = 1000 m, ISA + 10°C)	1,150 m	1,400 m
Minimum landing runway length (Z = 0)	895 m	950 m
Block fuel for a 185 km flight leg	273 kg	276 kg
Block time for a 185 km flight leg	32 min	32 min

The ATR 42-100 can carry 42 passengers on a 1,300-km non-stop flight, or on four 185-km flight legs without refueling. The ATR 42-200 can carry 49 passengers on a 1,450-km non-stop flight, or on five 185-km flight legs without refueling.

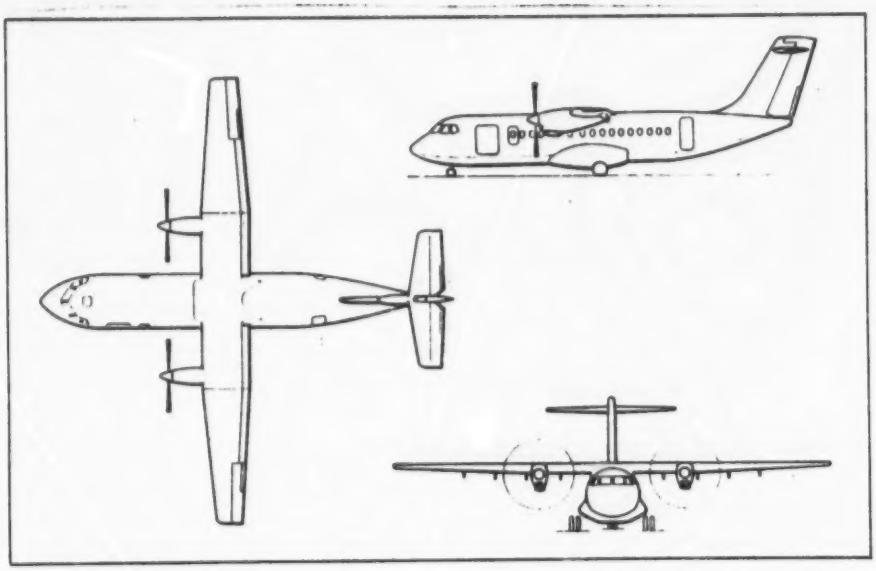
The Market

The civilian third-level commuter market has maintained itself best, whereas the annual increase for the short, medium and longhaul aircraft (the traffic of which used to increase by 6-7 percent per year during the 1970's) is now down to practically zero.

During the past few years, the annual growth in commuter traffic has ranged from 20 to 30 percent; according to various analysts, it averages 12 percent in the United States.

We must also not forget the military market which is large, first of all in France and Italy, for the Armed Forces and the Fleet Air Arms (especially with the replacement of the N 2501 and N 262).

Our market studies tally with those of several manufacturers and client companies; they show that, by 2000, the potential market for 30-49 seaters will be about 2100 units, and that for 50-70 seaters, 1700, i.e. a total of 3800; our penetration forecast leads us to estimate our share of the market at 800-1100 aircraft.



Outside Dimensions

Overall length	22.500 m
Span	24.572 m
Overall height	7.550 m
Landing-gear track	4.100 m
Passenger door (rear left)	0.750 x 1.750 m
Standard cargo door (forward left)	1.275 x 1.530 m
Door limit height	1.265 m

Inside Dimensions

Cabin length (passenger cabin + luggage compartment)	13.850 m
Maximum cabin width	2.570 m
Cabin height	1.910 m
Cabin volume	44.800 m^3
Forward luggage compartment volume	5.800 m^3
Rear luggage compartment volume	2.700 m^3
Hand-luggage racks volume	1.900 m^3

It should be noted that 40 percent of this market is in North America.

What counts is direct operating costs; on a 360-km flight leg, for 2000 flight hours per year, and with kerosene at US$1.4 per gallon, direct costs are more than 20 percent lower than those of existing aircraft (CHC 7, HS 748 and F.27/500), and more than 10 percent lower than those of aircraft now under development (DHC 8, SF 340 and EMB 120 Brasilia).

At 1981 prices, the selling price of the basic model is 5 million dollars, and the operation is out of the red by the time the 400th aircraft is sold.

It is interesting to take a look at the French market, including the Overseas Departments and Territories: 169 civilian and military aircraft, including:

- 66 F.27/227--in particular 24 at Air France (15 for the airmail service, 9 for Air Inter)

- 57 N 262.

This amounts to a market of 130-150 aircraft by the year 2000.

Characteristics of the ATR

It is an aircraft which appears to be very simple but which, in fact, is very hard to develop so as to reach the direct operating cost objective; as a result, its aerodynamic characteristics must be designed with the utmost care. We also tried to minimize a number of inconveniences having to do with comfort, such as noise (because of the propellers), or the sensitivity to gusts, which is not negligible in an aircraft which frequently goes through layers of clouds, and for which we have used Generalized Active Control.

Therefore, we have systematically used Optimum Cost Design methods; in addition, the whole plane was drafted on screen (Computer Aided Design and Computer Aided Manufacturing).

We are using new materials or modern concepts only when they do not increase the cost.

A few words about performances:

- weight: 15 tons
- range with 42 passengers: 1350 km
- speed: 513 km/h
- single-engine ceiling: 13,400 feet
- landing strip: 900 m
- landing, especially in Category II, either with two automatic pilots or with one automatic pilot and one head-up display
- no servo-controls.

Finally, a word about our competitors:

By having 4 passengers in a row, we have reduced our actual competition to the DHC 8 which, however, is at a disadvantage because of its diameter and because of "auto-competition" from the 50-seat DHC 7 and from the Buffalo for the military version.

With a 30-inch spacing, the ATR offers 46-49 seats (compared with 36 for the DHC 8), and up to 60 in its elongated version.

As far as direct operating costs are concerned, we are 25 percent better off than the F 27, and would still be 12 percent better off if the F 27 were to receive a new engine.

Everybody agrees that the ATR 42 owes its leading position on the market to its capacity, its development potential and its operating cost.

In this respect, the selection of a 1.90-m diameter across the floor, certainly due to the French military, has been decisive.

What were the main stages which led to a decision through these years of study, from 1979 to 1981?

First, an important event which enabled us to cut by half our expenditures and our risks; the similarity between our AS 35 project and Aeritalia AIT 230 project, which resulted in the ATR 42 commuter aircraft, and above all a common will at all levels of both companies, soon followed by both governments, to cooperate on this project.

A preliminary agreement was signed in 1980, then a full and detailed industrial agreement in the fall of 1981.

Without going into details, both companies agreed to cooperate and to create a small economic interest group to manage our cash flows and ensure that there would be only one sales entity.

The second stage marked a decisive turn as far as the "credibility" of our business was concerned: the 1981 Bourget show where we were able to present:

- a life-size model placing special emphasis on the comfort provided by the diameter--which is equivalent to that of a B 737--and by the luggage racks, etc. (one commuter airline signed an order on the spot).

- guaranteed performances, prices and delivery dates... for all orders placed before the commuter convention which was to open on 9 November in New Orleans.

We had also selected the engine, the 2000 hp Pratt & Whitney PT7, called P.W. 100/2, which fully met our requirements and assured us that, in 1985, we would have a fully developed engine to equip the elongated 50-60 passenger version.

And this is when we convinced both our "sleeping partners" and our first clients, who signed orders with the sole condition that the project be effectively launched by 1 November.

When I say that we convinced our sleeping partners, I should say that we first gave them cause for concern, but that there remained much to be done... in a very short time.

- In July, we imposed constraints upon ourselves; we had to:

- get 50 conditional orders,
- sign a detailed industrial agreement with Aeritalia,
- and of course receive from the governments an aid to development, to be reimbursed with each aircraft sale.

- By 31 October, we had 56 conditional orders from 14 companies worldwide (25 from U.S. commuter airlines, from a large European airline, from Finnair...).

- On 5 November, the presidents of the two companies signed an industrial agreement, but the agreement with the French government was signed only late on 6 November. On 7 November, I got on board to announce to the somewhat anxious U.S. commuter companies that the project had started.

Since then, well, we have been working relentlessly, all organizations and all Franco-Italian committees are in place; an operational group integrating all disciplines is operating in Toulouse, and the two governments are now actively preparing their agreements on procedures, especially on sales financing.

Project Schedule

June 1984: first prototype off the assembly line

August 1984: first flight of the first prototype

October 1984: first flight of the second prototype

Third quarter 1985: European and U.S. Certification according to Part 25

Fourth quarter 1985: First deliveries to airlines.

The ATR will be built in France and in Italy. The assembly line for the civilian versions will be located at the Aerospatiale plant in Toulouse, that for the rear-loading versions in Italy, at one of Aeritalia plants.

9294
CSO: 3102/276

TALBOT DESIGNS, BUILDS ROBOTS FOR IN-HOUSE USE

Paris INDUSTRIE & TECHNIQUE in French 10 Feb 82 pp 28-29

[Article signed A. P.: "Robots Lead the Samba"]

[Text] Six welding robots, at six degrees of liberty, in service at Poissy plant.

Designed and built at the plant, these robots perform nearly 40 percent of subframe welding operations on the Samba and Horizon. The Samba subframe comprises 336 resistance welding points. In the new installation four conventional multipoint type machines perform 174 of them, and the robots 128. There are 34 points which do not lend themselves to simple automation and for the moment are still manually welded. All operations are performed on an automatic transfer assembly line fed by self-propelled overhead carriers. Transfer of body components is by mobile Atlas lifting pallets. The installation comprises 11 stations, including loading and evacuation stations and a free station intended for possible manual repair operations. Capacity of the installation was calculated at 60 vehicles per hour. A total of 12 persons, including adjusters, are assigned to this production phase. After placement of front and back floor sections begins the first welding operation, on internal sills, at two multipoint stations (66, then 44 welding points). A composite station follows, with 8 automated and 12 manual welding points, where begins the positioning of vertical joining beams. This operation is completed at a robotized station for 58 welding points and another composite station for 40 automated and 36 robotized welding points. After placement of the forward portion of the body on the line, a manual assembly station for 10 welding points is completed by a composite station for 16 automated and 12 manual welding points. The last two robots, for 34 welding points, complete the cycle. Completed subframe assemblies are then removed.

According to firm executives, installation was completed without problems. "Our robots were installed in one weekend. On Tuesday the line was functioning without difficulties. Contrarily to what I had thought, we have more trouble with conventional equipment than with robots," says Andre Moinard, production manager at Poissy. "That has enabled us to demystify the robots vis-a-vis ourselves and the maintenance personnel," adds Rene Antic, in charge of metalwork methods, who led the project.

Construction of the six Barnabe robots began in 1980. They were designed by a small team of three people and built in a specialized shop. This second generation succeeds the Anatole robot designed by the same team in 1973 and used on assembly lines for the 1307/1308 series. The latest are of "all electric" type. The Inland direct current motors have associated reduction gears.

The six degrees of liberty break down into two rotations of the terminal wrist, one arm rotation, wrist support, a limited rotary tilting of the arm, a rotation of the support in a vertical axis, and a horizontal translation movement of the whole.

The first version comprised three rotations and three translations. The new version with five rotations is more easily directed and more accurate. A microprocessor provides electronic servocontrol. Despite the weight of welding heads (about 40 kg), electric control was preferred to hydraulic. The latter was considered inferior from the standpoint of temperature adjustment, noise, leaks, and filtration. Welding transformers are housed in the rear portion of the robot and serve as counterweights. Precision of welding points is assured to a tolerance of 0.7 mm. Captors at the arm extremities control execution of the operation. The entire manufacturing cycle is coordinated by Telemecanique TSX 80 programmable automatons.

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CSO: 3102/197 END

JPRS 81077

17 June 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 107

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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REPORT ON ORGANIZATION OF EUROPEAN BIOTECHNOLOGICAL RESEARCH

Paris L'USINE NOUVELLE in French Mar 82 pp 12-13

[Article by Michel Dabaji: "Biotechnological Research: Europe Has Some Ideas"]

> [Text] Perhaps we could take some lessons from what is happening in the great laboratories of our European neighbors, not so much from the research topics--we probably have the same kinds of research in France--but from the other elements: Might there not be some cases in which they have used originality in solving the problems of technology transfer, efficiency and organization?

The themes chosen were very specific: biotechnologies and agro-nutrition; enzyme engineering and fine chemistry; production and selection of seeds. Then around each of these themes a team was organized of about 10 French research specialists from both the public and private sectors. Then, for each theme, two delegations went abroad for 1 week each to "assess the state of advancement of these techniques in Europe" by visiting laboratories and industrial companies considered to be "in the vanguard," at least on our continent.

When we also realize that for each of the first two themes, for example, 5 countries and 11 laboratories were visited, or that the sectors of activity covered by the laboratories visited by the agro-nutrition delegation ranged from meat to additives, with opportunities to view yeast manufacture, methanization and the dairy industry along the way, at such places as Gist Brocades, ICI [Imperial Chemical Industries Ltd.], GBF (Institute of Biotechnology, Munich), and Zurich Polytechnic (ETH [Federal Institute of Technology]), or Tate and Lyle, Carlsberg, Novo, Akzo, Dechema-Frankfurt, the University of Lund (Sweden), etc., we see that the National Association for Technical Research (ANRT), organizer of these trips, did things well and that there was certainly something to satisfy even the fussiest delegate!

Those who were able to participate seemed satisfied, or at least the ones who appeared at a conference held recently in Paris and presented a "preliminary report" on these visits pending the final technical report, which will be published very shortly.

The first conclusion is that even though the enterprises and public services visited (despite the breadth of coverage) naturally did not represent the entirety of European research being performed in biotechnologies, and more

particularly even though many of the activities will evidently remain confidential, it was possible to "get an idea of trends." Thus, Pierre Monsan, of INSA [National Institute of Applied Sciences], who as a member of the university community joined the enzyme engineering delegation, was particularly attentive to research topics. In particular, he remarked on the efforts of Ciba-Geigy, ETH and Organon (of the Akzo grou) as well as Carlsberg, GBF and Novo.

On the other hand, Pierre Galzy, another academic (a professor at ENSA [National School of Agronomy] of Montpellier) in the agro-nutrition group, concluded on the basis of the "great European successes" that a small number of factors are necessary to the development of a new industry. That is, there may be an industrial tradition: Gist Brocades produces baker's yeasts and Novo produces insulin, and "the experience acquired in research, production, and marketing has made it possible to expand their fields of activity." There can also be access to raw materials under favorable circumstances: "The most spectacular example is that of ICI, which had North Sea methane and..an advanced process for obtaining methanol from that methane." That gave ICI the ability to leap, as it has done, into producing proteins from microorganisms grown on methanol. A third factor, according to Galzy, is that "it is necessary to organize teams of scientists and high-level technicians and give them the resources--at Gist Brocades, 10 percent of the personnel are in research!"

He offered a number of remarks on the organization of this research. "In the five countries I visited, research was carried out in direct cooperation with industry...There was even a case in which one enterprise, Tate and Lyle, had established its laboratory in Reading (Great Britain) at a university!" Though work on selection of strains and perfection of principles and processes may be the business of a public laboratory, development generally remains the province of industry. And "we often found pilot workshops, used for constant improvement of processes, located alongside production facilities."

As for financing, Galzy remarked that "in general the state furnishes the premises, the fluids, the overhead and a share of salaries and equipment. For operations, the sources are different, but there are automatic, renewable state subsidies and always some private contracts, which everyone told us are completely essential. Finally, it happens that some researchers are recruited just for the duration of the contract, which in general is awarded after a call for proposals on top-priority themes. "The only exception was that in Switzerland a public laboratory could ask the supervisory body to approve a program on an original subject not included among the top-priority subjects."

A Desire for Concrete Applications of Research

Also, in general not much of the work is cooperative, and thus there is not much dissemination. "Furthermore, with people trying to proceed very quickly, they fail to examine the risks. Only at ETH, for example, were they concerned with knowing how the strains obtained by genetic engineering behave under conditions close to those of industrial cultures." There are some exceptions: Kulmbach (FRG), a center specializing in meat in all its aspects, publishes all of its findings, even if acquired under contracts! Carlsberg (funded by the Carlsberg-Tuborg breweries but operating under articles of endowment) specializes in all the problems (even noise!) of the malthouse and brewery, but its

findings are available to competitors throughout the world! The same is true for Tate and Lyle (sweeteners). "In these three cases, all of the research is conducted with a desire for concrete applications; links with industry are encouraged." On the other hand, at GBF or ETH, multidiscipline activity comes first: "A framework that is better suited to relatively unorthodox ideas and that enables the research findings to be applied in several sectors."

Bernard Malige, director of research at Fromageries Bel, saw the same things as Pierre Galzy--substantial resources, participation by the state, research oriented toward industry "even in the public labs," quasi-generalization of contracts with or without confidentiality. "In the FRG and in Switzerland we even found some French researchers on extended stays in some specialized laboratories, one of them having been sent by a manufacturer in the IAA [Agricultural and Food Industries]." While he noted that manufacturers like Tate and Lyle, ICI or Gist Brocades evidently poured enormous resources into research, Malige was struck by the size of the pilot installations: "Without a large capacity, they repeatedly told us, it is not possible to extrapolate the research and demonstrate feasibility." He also remarked that at Kulmbach, which is also concerned with product control, the departments are run by a director appointed for 2 years and not eligible for reappointment.

But above all, as a real dairyman, Malige could not help but be impressed by the visit to the applied research center of DDS (a Danish company that manufactures ultrafiltration membranes): "On the same site was the largest plant for the treatment of whey by ultrafiltration, Danmark Protein. This was not just an accident!" And they insisted that the collaboration between the manufacturer (DDS) and the user pays off. "At the DDS research center, established in 1980 (15 persons), we visited autonomous test benches capable of treating 1,000 to 3,000 liters/hour of milk. A third of the area was reserved for pilot plants."

Malige saw several clients of DDS. The most remarkable certainly was Danmark Protein (an equal partner of Kali Chemie and Fromageries Danoises), which since 1979 has treated a million liters of whey per day: "They had 2,200 square meters of membranes and two fluidized bed drying towers, with everything run by computer; the powder is being used by Kali in a confidential application."

Jean-Paul Leroux (an enzyme delegation member from ELF [French Gas and Lubricants]-Bio-industries) put more emphasis on the organization of the research. "At Lund, which is a university laboratory," he explained, "people work in isolated enclaves that carry out a project from one end to the other. The enclaves are almost like small or medium-sized industrial enterprises; if the process is sold, the person in charge of the project takes part in its development at the factory level. There even exists a system to see that the researcher who thus enters the private sector will not be penalized relative to his colleagues--on the contrary." There is a drawback, however--too much compartmentalization, which isolates the teams.

Akzo, it seems, was very "open" about proposing licenses or collaborations. As for Carlsberg, Leroux was struck by its "peculiar" articles of endowment: "It is a laboratory operated by a private firm, which is a foundation..and

which in turn has founded a company to develop one of its processes." But Novo (Copenhagen) was the most impressive of all, since "first, it is a research center where the experimentation facilities include 30 fully automated 500-liter fermenters. I have never seen such a setup." Moreover, it is organized not as separate enclaves but by broad technology areas (microbiology, enzymes, etc.) so that nothing is left out. "And then, to top it all off," concludes Leroux, "Novo has an evaluation board, which apparently has substantial powers. It meets every 3 months (that is, at short intervals) to evaluate the projects --to modify them or decide to abandon one of them. A project may be abandoned even if the preliminaries are 80 percent complete." Of course, Novo is a manufacturer, and perhaps that explains it.

9828
CSO: 3102/208

ELECTRONICS

EUROPEAN STRATEGIES DIFFER ON TECHONOLOGY-FOR-MARKETS CONCEPT

Paris L'USINE NOUVELLE in French 1 Apr 82 pp 59-61

[Article by Eric Le Boucher: "The End of Nationalisms"]

[Text] It is tempting for an electronics enterprise to acquire a patent, a license, or a technology abroad. A large number of technologic transfer agreements are signed every day. But the game can be dangerous: a new form of domination is being created.

Each week brings its batch of agreements signed between electronics companies. Even IBM recently decided to buy Japanese robots and resell them under its label (see L'USINE NOUVELLE No 11, of 11 March)!

There are strong reasons for this profusion, which appears to characterize the advanced technology industries. "The markets are so explosive that no one can any longer do everything in electronics," explains Herve Caron, deputy director general for planning at the French IBM subsidiary. Explosive and interconnected. In fact, the formation of telematics, office automation, and robotics on the borders of the once separate audiovisual, telecommunications, and computer disciplines, has forced the enterprises to rapidly expand their lines.

Computers or automatic telephone switchboards are no longer sold without being included in a "total system" for communications. If only to maintain their market, enterprises are compelled to acquire on the outside the missing know-how and equipment which they need. In addition, the sale of foreign equipment under one's own label creates "turnover." At a time when technical progress is accelerating, and when laboratory budgets are veritable bottomless pits, the opportunity is tempting.

Indispensible and attractive at the same time, the agreements are multiplying. Each firm has thus woven dozens of bonds which form gigantic spider webs on a worldwide scale. The confusion, however, is only apparent.

It is indeed difficult not to interpret the successive agreements reached by Siemens, Olivetti, BASF, and ICI, with Hitachi and Fujitsu, as a form of surrender on the part of Europe. Nor to also infer a new strategy perfected by the Japanese companies. A strategy that is the converse of the one widely used by the Americans, who established themselves by creating subsidiaries (ITT France, IBM France,

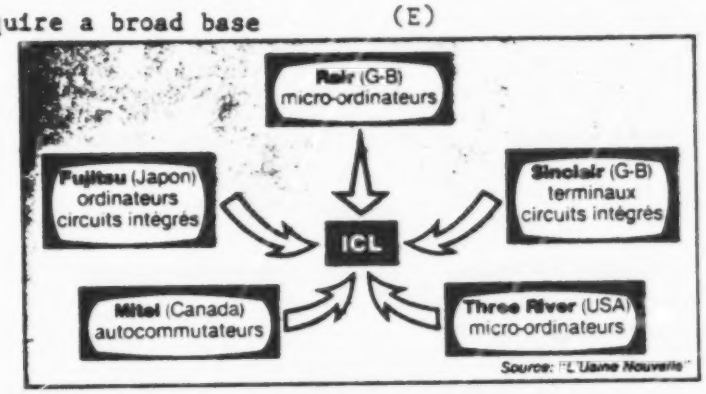
Japanese agreements in IBM-compatible computers.

Fujitsu (Japan)	ICL (England)	Integrated circuit design and manufacturing
	Amdahl (USA)	Integrated circuits
	Siemens (RDG)	Design, fabrication
Hitachi (Japan)	BASF (RDG)	Design, fabrication
	Olivetti (Italy)	Design, fabrication
	National Semiconductors (USA)	Design, fabrication

Except for IPL, there are no manufacturers of IBM-compatible equipment except the Japanese, who are gradually imposing their technology.

Acquisition of technologies: two examples.

ICL: rapidly acquire a broad base



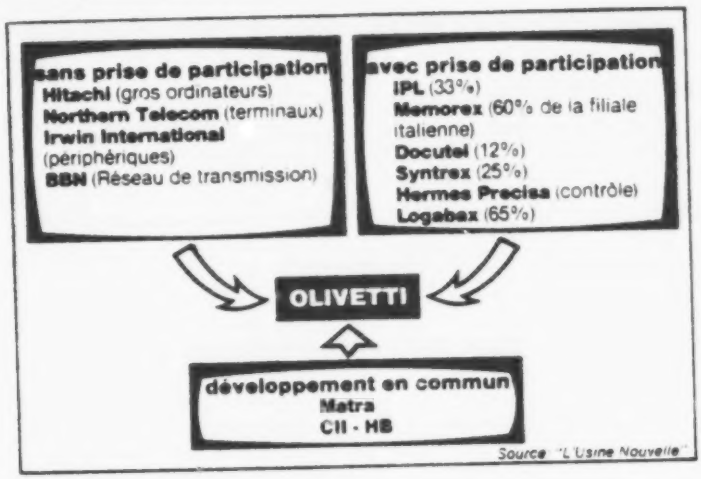
Key: (A) Sinclair (England): terminals, integrated circuits
(B) Three River (USA): microcomputers
(C) Mitel (Canada): automatic switches
(D) Fujitsu (Japan): computers, integrated circuits
(E) Rair (England): microcomputers

Source: L'USINE NOUVELLE

Motorola France, and so on), and that is founded on technologic agreements. The advantage of the former approach is that the Japanese enterprises thus capture portions of the market without becoming financially involved--a valuable asset for a country whose capital resources are lower than those of the United States--while generally retaining extensive possibilities for direct exportation directly from Japan (see table).

At a time when it seeks to endow France with an independent electronics industry, the government will not be able to avoid taking a position on the appropriateness of these agreements. Having rejected any form of national self-sufficiency by refusing to erect such bastions as French Telecom, French Components, or French Computers, the government has accepted that the nationalized companies participate in this international game. As Jean-Pierre Chevenement has pointed out, they will be allowed to sign agreements and seek know-how abroad.

Olivetti: pursuit of equilibrium



Key: (A) Without participation: Hitachi (large computers)
Northern Telecom (terminals)
Irwin International (peripherals)
BBN (transmission networks)

(B) With participation: IPL (33 percent)
Memorex (60 percent of the Italian subsidiary)
Docutel (12 percent)
Syntrex (25 percent)
Hermes Precisa (control)
Logabax (65 percent)

(C) Joint development: Matra, CII-HB

Source: L'USINE NOUVELLE

Is it better to buy a license or a company in order to acquire know-how? A difficult question, to which ICL and Olivetti had different responses. The Italian group often obtains participations, which assure a control of its partners.

"Copy And Then Improve"

While these agreements are attractive for the companies, they can jeopardize the independence of nations. What is good for Hewlett-Packard (to buy Hitachi patents for 64K integrated memories) is not necessarily good for the United States of America! This is preparing, for France, some delicate negotiations between the national enterprises and the Ministry of Industry. Some of the points of conflict are already defined: the large French computer, the giant videotape recorder plant, videodiscs, and standard integrated circuits.

The debate is complex. On one side, explains the director of one nationalized company, the enterprises "have two criteria for independence, which are in fact the same for any sector: freedom of movement and technical mastery." On the other side, they recognize the usefulness of a "higher," sectorial independence. For

instance, Pierre Chavance, vice-president of Alcatel Electronique, acknowledges that while the CGE group is not in the business of manufacturing integrated circuits, "French producers are still needed with plants sufficiently close to our laboratories."

Fortunately, a consensus is forming about the list of these products, indispensible both for sectorial and company independence. Integrated circuits are one of the "nodes" of the electronics industry, as Jean-Philippe Dauvin, of Bipe (Office for Economic Forecasting and Information), likes to call them. Nodes which according to him can be pinpointed, but which drift with the times. At times they move against the flow of the industry--"component mastery occurs upstream in materials (Agsa, ceramics, rare earths) and equipment"--and at times with the movement of the industry--"in consumer electronics the distribution network increasingly imposes its prices, its standards, and its image. Independent products will soon exist in electronics," he predicts.

As the touchstone of independence, the mastery of these nodes can lead enterprises to sign temporary agreements. "But if we sign technical agreements our immediate effort will be to free ourselves from them as soon as possible," adds Pierre Chavance. Because the success of this strategy of "copy and then improve" depends on the simultaneous inception of large research efforts to close the gap, and huge industrial investments to surpass in competitivity the original manufacturer.

The large French integrated circuit manufacturers who acquired American patents in 1978, are stumbling today against one or the other of these constraints. The English firm ICL, which in order to restore its position and to broaden its base and turnover sought technologies right and left (see insert), is therefore in some jeopardy. Olivetti has managed brilliantly so far; but that could well be because its director general, Carlo de Benedetti, almost always obtained participation on the part of his partners as a hold. In the agreements signed by IBM with Minolta (photocopy machine optics), with MCA (Phillips videodisc technology), or with Comsat (SBS satellite), the Number One in computers is certainly acquiring know-how. However, it very carefully creates a subsidiary with its partner to get him involved, or hires his engineers.

It is in this respect that balanced agreements are rare, especially among partners who are not so balanced. The union of CII and Honeywell testifies to it. The agreements woven by some companies, which are all too often baited traps, are part of what Georges Pebereau, director general of CGE, calls "the international division of skills."

Or in his words: "Microelectronics in Silicon Valley or the strength of the Japanese are part of a general phenomenon, and skills accumulate in zones." A terrible accumulation, which constantly increases the inequality; know-how goes to know-how as money goes to money.

11,023
CSO: 3102/243

EFCIS SAMPLES WORLD'S FIRST INTEGRATED MODEM

Paris ELECTRONIQUE ACTUALITES in French 26 Mar 82 p 33

[Article by J. P. Della Mussia]

[Text] At the Electronic Components Salon, Thomson-EFCIS will begin to sample the first integrated modem in the world. It is a C-MOS, aluminum-gate technology circuit, referenced as EFB 7510, suitable for teletex applications and meeting the CCITT V 23 and Bell 202 standards.

This type of circuit, eagerly awaited by users particularly for directory terminals, is currently being studied by seven or eight companies in the world as an integrated format; up to now it had been offered only in a hybrid configuration. EFCIS is preparing to produce one-half million EFB 7510's in 1983, with the potential world market being slightly higher than this figure.

The circuit is designed for bi-directional simultaneous transmission of asynchronous data at 75, 150, or 200 baud for sending, and 1200 baud for receiving. Associated with appropriate line circuits, it can be used with the general automatic switching network.

Three Filters With Switched Capacitors

The need for an integrated teletex modem arose about two years ago. EFCIS introduced its design very early, using conventional C-MOS, aluminum-gate technology in order to limit the development time. The company has a very extensive line of macrocomponents in this highly proven technology, a fact that has enabled them to complete a development in less than two years, which is a relatively short time for a circuit of this complexity.

The receiving portion of the EFB 7510 includes an eighth-order input filter, a correlator demodulator (based on a 131-step digital register), and a third-order output filter. The sending portion integrates a synthesizer, a 5-bit N/A converter, and a smoothing filter in the output. All these filters are of the switched capacitor type.

And finally, the circuit integrates a time base obtained from a 12.4 MHz quartz oscillator, and a reference voltage generator. It needs a +5V and -5V supply, and has one logical and one analog section. It is presented in a DIL 18-pin package.

A Reversible Modem in Late 1982

Thomson-EFCIS is currently studying two other modems. One, called the 7511, is intended for a major German account. Its specifications are less stringent than those of the 7510, but it uses a more advanced silicon-gate technology and is remotely supplied with 4V. Its chip is very small. The other, called the 7512, joins the characteristics of the 7510 introduced at the Salon, and the silicon-gate technology of the 7511. It should therefore cost less than the 7510, which will be sold for slightly less than 50 F in large quantities.

It also has a few improvements. The 7510, for instance, has one fast channel (receiving) and a slow one (sending) which are not interchangeable. This is not important for teletex applications, but could be a problem for terminal to terminal connections, for instance. In such cases, reversibility is necessary, and will be achieved with the future 7512.

The 7512 will also have more extensive functions than the 7510; in particular, it will conform not only to the American Bell 202 standard, but also to the Canadian Bell 202, which is compatible with Telidon. The 7512 will be offered in a 20-pin package, with 18 pins being identical to the 7510. It should be sampled at the end of 1982.

It should also be pointed out that EFCIS will be second source for a universal integrated digital modem, the 7910, currently being perfected at AMD (see ELECTRONIQUE ACTUALITES, 10 April 1981). This filter should be sampled in a few months by the American company. EFCIS will sample it in turn, after 4-5 months. Mass production is forecast for one year later.

The 7910, which fulfills all the functions that could be expected from a modem, and which is therefore very complex, should be offered at about 200 F in large quantities. Its applications will therefore be different from those of the 7510 and 7512.

11,023
CSO: 3102/240

FRENCH SUBSTITUTE FUEL PROGRAM CONTINUES

Paris AFP SCIENCES in French Feb 82 p 32

[Text] Paris--The "Gasohol" program, begun by the Barre government in January 1981 in order to perfect petroleum fuel substitutes, will be continued by the Mauroy government.

Mr Edmond Herve, minister delegate for energy, said on 19 February that the government intended to develop a "coherent and ambitious program" for developing substitute fuels.

Responding to a written question from Senator Raymond Soucaret (Left Radical, Lot-et-Garonne), Herve pointed out in the OFFICIAL JOURNAL that as of this moment the means for directing this program are in place, so to speak, and that 150 to 200 million francs a year will be spent in 1982 and 1983.

This "Green Fuel" program is justified by the amount of petroleum consumed in the transportation sector (40 million petroleum equivalent tons), and above all by automobiles (27 million petroleum equivalent tons). Until now, there has been no substitute for hydrocarbon fuels (petroleum and natural gas) which could ease France's dependence on foreign suppliers.

Mr Herve pointed out that in the weeks to come a commission for substitute fuel production would be put together, consisting of government officials, scientists, industry representatives and consumers.

The first phase of the program consists of progressively adding a small percentage of substitute products, like ethers or alcohols, to premium grade fuel, while simultaneously developing nationwide systems of production.

Thus, several projects will be undertaken in 1982 and 1983: a research platform at Soustons (Landes), pilot plants for producing a mixture based on Jerusalem artichokes, for wood gasification, for methanol and higher alcohols...

Once these tests are completed, the delegate minister for energy specified, "one can foresee the marketing of a particular new fuel, which will incorporate significant proportions of substitute products, and which will have been proven competitive."

Since last July, specialists from the government have tested these gasohol-premium blends in over 700 cars. The "Gasohol" program had been launched in January 1981 by then Minister of Industry Andre Giraud, who, at that time, drove a Renault fueled by an alcohol-premium mixture.

9939
CSO: 3102/224

ENERGY

FOUR MW WAVE POWER PLANT TO BE BUILT OFF SCOTLAND

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
6 May 82 p 7

[Article: "A Wave Power Station off the Scottish Coast? Britons Consider the Project Profitable/Cost Advantages for Serial Production"]

[Text] Frankfurt, 5 May--A wave power station, according to calculations by Scottish scientists, could be profitable even when compared with a diesel generator. Investigations for a site on the Scottish Atlantic coast are supposed to have shown this because costs would be less than 10 cents per kilowatt hour, as reported by the Scottish Development Agency. Now a 4-megawatt demonstration plant is planned; it presumably will be located off the island of Mull. It is said to have been designed by an engineering group at the National Engineering Laboratory [NEL] at East Kilbride near Glasgow. As further reported, a second plant of this type could be built in the South Pacific and, presumably on the basis of locally available concrete raw materials have even lower costs. Moreover, by means of serial production of 8,000-metric-ton modules in shipyards, docks, or on a simple ship, construction costs could be lowered by up to 25 percent, the Scottish scientists say.

According to the announcement, the generator developed at East Kilbride consists essentially of a 65-meter-long and 35-meter-high breakwater protruding 10 meters from the water. It would be anchored 1-3 kilometers from the coast in a conventional manner by means of rocks. The seaward side would have openings, and incoming waves would increase the air pressure in the upper part of the breakwater. The air pressure would then be used to drive air turbines. The system requires no anchoring with ropes, which is the main problem with other designs. By connecting several modules in a row, maintenance is facilitated and, in addition, a protected anchoring location is obtained.

The operators of the project have submitted the construction proposal to the British Ministry of Energy and hope that construction can start before the end of the year, so that the power station can go into operation on schedule in the winter of 1984. The ministry has already assumed a large part of the costs for an experimental wind power station on the Orkney Islands in North Scotland, and it is expected that it will bear 80 percent of the costs of the wave power station. Repayment is to be made by means of the electric current produced. The new NEL generator is part of a series of plants under develop-

ment in the United Kingdom. A more advanced system based on pontoons bobbing up and down which convert power by means of high pressure hydraulics is being investigated at the University of Edinburg by Stephen Salter. Electric current production costs estimated at this time amount to 8 cents per kilowatt-hour. The target for the completed system is near 5 cents.

5586
CSO: 3102/280

ENERGY POLICY: VIEWS ON COAL CONVERSION

Zurich CHEMISCHE RUNDSCHAU in German 15 Apr 82 pp 5-7

[Article: "Energy Policy Problems"]

[Excerpt] Coal Conversion with Many Question Marks

Among the public and in the political arena, high hopes are placed on coal conversion. Many believe that the return to coal chemistry will become possible in the foreseeable future.

From the available cost estimates for coal gasification and coal liquefaction, no sufficiently reliable conclusions can yet be drawn[14]. There is not enough experience to be able to predict the costs of large installations with elaborate environmental protection equipment. Also a factor to keep in mind is that the costs of coal gasification and coal liquefaction depend to no small extent on the price of coal (It will always take 3 tons of coal to produce 1 ton of liquid products!). If a worldwide run on coal should start, then the assumption of stable coal prices on the international markets--such as held until 1979--would have to be dropped. The price at the mine and above all the transportation costs of coal would increase sharply and the price difference between coal and crude oil and fuel oil would diminish. Such a trend break in the coal price curve (cif price) would have to be taken into account especially if the worldwide expansion of nuclear-fueled electric power plants should suffer further setbacks.

Also indefinite is the raw material base for coal conversion in the FRG. To what extent will it be possible to use lignite as the primary raw material base? Obviously, this question can only be answered when the nuclear-energy-expansion picture is clarified. It would be very unfortunate if lignite, which due to its properties is so much better suited than hard coal for gasification and liquefaction, should have to be used again in previous quantities for generating electricity. It is preferable to use lignite as the basis for coal conversion. The production of synthesis gas from lignite already appears to be near the break-even point.

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14. The very optimistic economic assessment of the researchers at Gulf Research and Development Co. for the Solvent Refined Coal II process developed by them for producing the starting materials for ethylene and BTX production assumes among other things a coal price of $ 32/t (1978 U.S. dollars). See G. A. Harris, C. E. Sinett and H. E. Swift, "SRC-II is a Promising Petrochem Feedstock Source," Oil and Gas Journal, Aug. 25, 1980, p 119 ff.

Three Central Questions for the Production of Coal Oil and Coal Gas

Along with the decisions to be made by economic policy concerning the type and amount of synthetic oil and gas to be produced from coal, there are three questions--in addition to the question concerning the economic conditions of various processes--to answer in the FRG:

--How should the investments be apportioned between the various processes for producing synthetic gas (synthesis gas, synthetic natural gas, etc.) and synthetic liquid products?

For clarifying this question, complete economic cost-utility analyses are required--as soon as fairly reliable cost estimates are available--which also include the costs for building or expanding the infrastructure and which, beyond this, attempt to evaluate positive and negative external effects.

--How can the business risk be made bearable?

In the case of large hydration facilities, projects are involved which always require an investment of DM 3 to 4 billion, if not more. The economic feasibility depends, aside from the price of coal and refining costs, decisively on the price curve for oil products. Also, in case of a worlwide increase in crude oil prices to 40 or 50 dollars per barrel (1979 price basis), the need for government aid can hardly be avoided. Then the question arises: In what form (capital subsidy, guaranty or renewed hydration preferences) should this aid be granted from the standpoint of economic effectiveness?

--To what extent should such investments be made in the FRG?

In view of the extraordinarily large space requirements and the considerable environmental pollution which--even using expensive environmental protection equipment--will occur, the prerequisites for greater expansion of synthetic oil production in the FRG are unsatisfactory. On the other hand, other industrialized countries have a comparative advantage with regard to the development of such technologies. Thus, it makes sense to explore the possibilities and opportunities for joint synthetic-oil-production projects abroad where both relatively cheap coal and the required sites are available. Limited expansion of facilities for coal liquefaction is, of course, required in spite of the FRG's comparative site disadvantages not only for assuring emergency supplies but also because the export of new technologies presumes the existence of efficient reference installations at home.

Large-Scale Experiments are Required

From the foregoing it follows that before the switches for investments in coal conversion can be confidently thrown, the foundations for the decision process must be carefully worked out. For this reason, large-scale experiments involving the various technological processes competing for the limited capital are required at home and in joint ventures abroad.

If the restructuring of petroleum refining in all industrial countries is accelerated in the future, there will be no compelling reason for increased investments in coal liquefaction and SNG production in the coming decade. The new era of coal conversion may begin--with the exception of individual forerunners in coal gasification, especially synthesis gas--only around the turn of the century or thereafter.

9160

CSO: 3102/271

STUDY CONCLUDES COAL HYDROGENATION UNECONOMICAL IN FRG

Duesseldorf CHEMISCHE INDUSTRIE in German Apr 82 p 201

[Text] From a strictly business management viewpoint, coal hydrogenation of German hard coal is uneconomical. This conclusion is reached by Veba Oel AG [Veba Petroleum, Inc] of Gelsenkirchen in a "Preliminary Study on the Construction of a Large-Scale Commercial Coal Hydrogenation Plant," which was presented to the Federal Ministry for Research & Technology. On the basis of today's costs for hard coal (German and imported) and heavy oil, as well as today's proceeds for liquid products--gasoline and light heating oil as finished products geared to market requirements--the use of German hard coal would result in an annual subsidy requirement of about DM 1.4 billion. Under various assumptions as to the use of imported coal and heavy oil, on the one hand, as well as price escalation rates for raw materials and products on the other, profitability is achieved, but only after a long initial period.

The preliminary study, in which the firms Linde, Lurgi, Veba Kraftwerke Ruhr [Veba Ruhr Power Stations], and Huls Chemical Plants also participated, showed that large-scale commercial hydrogenation of hard coal, even in combination with heavy oil according to the further developed Bergius-Pier process, is technically feasible in the FRG, as stressed by Veba Oel. However, the commercial risks which also occur when imported coal is used, even in combination with heavy oil, exceed the capabilities of a private industrial enterprise. Concerning the open questions on the further development and the optimization of large-scale commercial hydrogenation, Veba has determined that here above all the operating experiences from the Bottrop Coal Oil Plant would yield important insights.

A plant design was investigated for a coal input capacity of 3.7 million metric tons per year. The production is to be 1.95 million metric tons per year of liquid products; to secure high on-stream time, the layout is in four trains, two of which are also designed for operation with heavy oil.

A design of the coal plant for alternate use of coal or heavy oil proved not to be sensible. In such a case the plant would, for instance, have to be supplied with approximately 11 million metric tons per year of refinery residuums (TOP residuum [topped crude]). The quantities of products resulting from this (approximately 8 million metric tons per year), which would have to be further processed outside the plant, would not be usable in nearby refineries without expensive construction modifications.

The combined design of the plant has the following advantages: flexible mode of operation, conforming to the market and cost situation of raw materials; clearly lower operating losses than with a coal hydrogenation plant using only coal; contribution to the further refining of conventional petroleum through conversion of the heaviest refinery residuums into fuels, light heating oil and chemical raw materials; availability at all times for 100 percent use of coal as, for instance, in times of crisis.

The process works as follows: Coal brought in from storage after grinding and drying is mixed with oil recycled from the process under the addition of a catalyst. The mash is compressed to a pressure of 300 bars and heated to temperatures from 460 to 475°C and is hydrogenated under these conditions. The gases formed during hydrogenation (C_1-C_4) are conducted to a gas-processing unit. After separation of a hydrogen-sulfide-rich offgas, which is supplied to a Claus plant, liquefied gas and fuel gas are obtained. The fuel gas is used for firing the process heaters or for the production of hydrogen. Liquefied gas is obtained as a marketable product.

Following hydrogenation the liquid products are condensed and separated into gasoline and middle distillate by distillation at atmospheric pressure. While the middle distillate is obtained as a specification-grade light heating oil, the gasoline must be further processed by refinery techniques.

Following vacuum distillation, the coal not converted during hydrogenation, the coal ash, the catalyst and highboiling hydrocarbons are used in a gasification plant laid out in three trains for hydrogen production. The ash obtained is stored.

Investment costs for this plant, including startup costs, come to DM 6 billion (1981 prices). The personnel requirement for operation of the large-scale plant is 3,000 employees. The land area requirement is approximately 300-350 hectares. From planning to putting into operation, not less than 8 years will elapse.

The plant can be built within the limits of applicable environmental protection requirements. Gas and dust emissions are less than the allowable amounts according to TA-Air [TA--Technische Anforderungen--Technical Standards]. However, should the TA-Air be changed in the direction of decidedly more severe approval conditions, in accordance with newly proposed laws currently under discussion, this could come into question. Requirements for introduction of effluents [into the ground water] are adhered to. Requirements with respect to acoustic emissions can be met--although by means of expensive measures.

All plant sites investigated in this study (two in North Rhine-Westphalia, four on the North Sea Coast) are in principle suited for the projected plant. Completion of the plant is not assured politically for all plant sites. Public resistance would be apt to delay construction considerably, if not prevent it altogether.

5586
CSO: 3102/280

BRIEFS

METHANOL REACTOR SUCCESSFUL--The methanol reactor--until now the largest in the world--which was put into operation in the fall of 1981 is running without a hitch according to a recent announcement by Lurgi, the reactor's designer and builder. The reactor was built on the premises of Union Rheinische Braunkohlenkraftstoff AG in Wesseling and employs the low-pressure process developed by Lurgi Kohle und Mineraloeltechnik GmbH. It has a capacity of 1,200 tato. After just 3 weeks of operation, the installation could be turned over to the customer in a routine manner. Lurgi is presently building 3 more methanol facilities which likewise employ the low-pressure process: VEB Leuna (2,000 tato), Sabah (Malaysia, 2,000 tato) and Pertamina (Indonesia, 1,000 tato). [Text] [Duesseldorf EUROPA CHEMIE in German 29 Mar 82 p 142] 9160

PRIORITY FOR COAL RESEARCH--The highest growth rates in overall expenditures for energy research through 1985 will be in the outlays for coal refining, especially for coal gasification. This stems from an energy research program that the Federal Research Minister Andreas von Buelow will lay before the cabinet for ratification. According to this program, the research outlays for coal gasification will increase from DM 166 million in 1982 to DM 672 million in 1985. On the other hand, the outlay for coal liquefaction will increase only from DM 123 million to DM 163 million during the same time period. Thus, overall, the following amounts will be made available for coal refining: in 1982, DM 289 million; in 1983, DM 438 million; in 1984, DM 604 million and finally in 1985, DM 835 million. In total, the energy research program for 1982 involves DM 2.3 billion compared to DM 1.97 billion in 1981. The scheduled outlay of funds for the years 1983 through 1985 is, respectively, DM 2.5 billion, DM 2.75 billion and DM 3.1 billion. [Text] [Duesseldorf EUROPA CHEMIE in German 29 Mar 82 p 141] 9160

CSO: 3102/267

FIRST EUROPEAN FLEXIBLE WORKSHOPS, CELLS BEGIN PRODUCTION

Paris L'USINE NOUVELLE in French 25 Mar 82 pp 105-107

[Article by Patrick Piernaz]

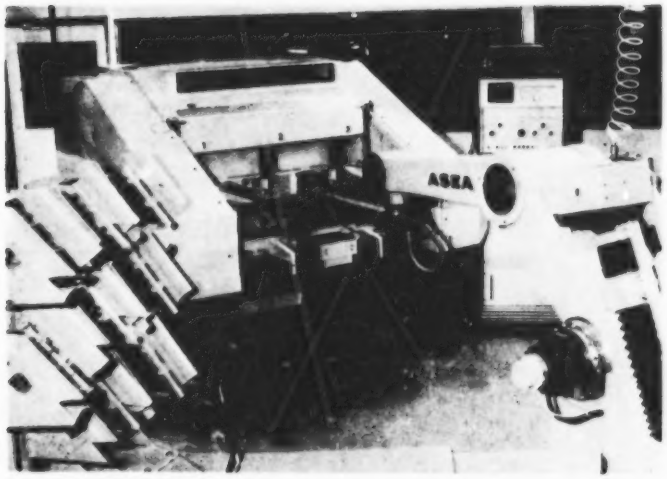
[Text] In Italy, in France, and in Sweden, the first flexible-cell shops are beginning production in the automotive, mechanical, and electronics industries. Our special correspondent at the Milan conference has the first figures and the first tallies on the new generations of production shops.

At Maserati, in Italy, the first models of the Biturbo 2000 cars are beginning to be mass produced. The announcement of this news was properly welcomed by the small world of sports cars. But this time, it is not only the esthetics and performance of the car that are newsworthy, but rather the fabrication of the six-cylinder engine: its aluminum parts (blocks, cylinders, heads) are produced in a flexible shop that has just been placed in operation at the Modena plant. The description of this installation was one of the highlights of the "Flexible Shops" conference organized in March, in Milan, by the Association of Italian Machine-Tool Builders.

This meeting made it possible to learn about the progress of Italian flexible systems, as well as about other European installations, with the exception of German ones, who after all, have several flexible shops at Messerschmitt Bolkow Blohm (aeronautics), Volkswagen (trucks), and Trumpf (sheet metal parts), among others.

In Italy, the Maserati installation was furnished by Olivetti, which installed ten Horizon 22 machining centers connected by two rail-mounted pallet carriers. This shop turn out 30 engines per day in two shifts, which corresponds to one engine every 30 minutes. Eight different parts are produced on this machine complex, with a machining time of 12-60 minutes per part. "For the user, this shop offers three basic advantages: machine operation with no idle time, the possibility of easy tooling for future parts, and the knowledge that production will continue if one of the machines breaks down," said Olivetti's Sergio di Padova.

At the present stage of the installation, the Italian firm has not centralized automation control. Each machining center is autonomous, is equipped with tool control sensors and dimension sensors, and each identifies the parts to be machined according to pallet coding. Each unit's numerical control memory stores the programs for the various parts to be machined. The next step in this shop's



Fabrication island for printed circuits at Asea, in Sweden. The robot loads and unloads two NC drilling machines.

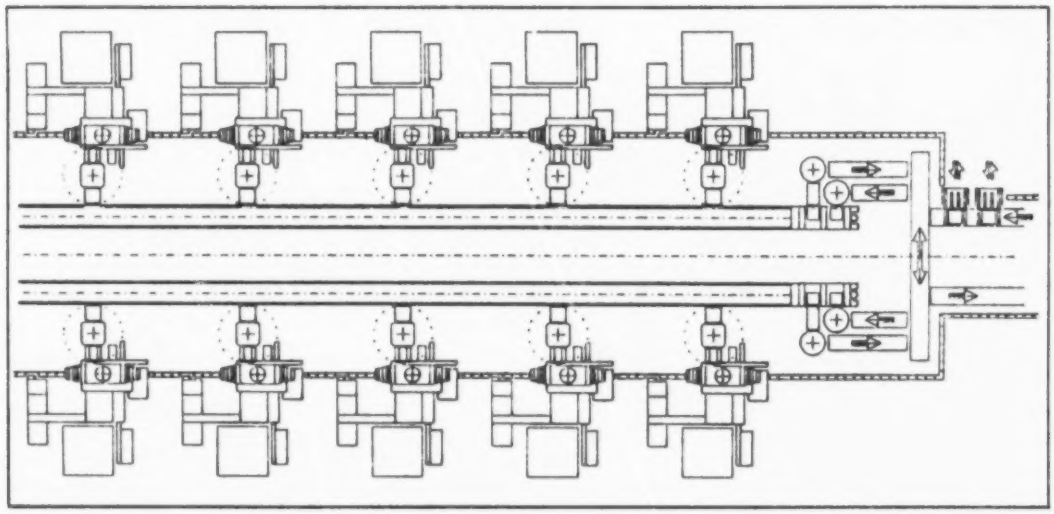
development will be centralized computer control for direct numerical control (CND), similar to the installation adopted by Comau (Fiat subsidiary) at the Iveco plant in Brescia. This shop produces 220 parts per day in two shifts, mainly aluminum and cast iron engine components, and truck gear-box housings.

Shop Design: Significance of Computer Simulation

The installation includes 12 horizontal spindle machining centers connected by a roller conveyor-belt track. It is entirely controlled by two PDP 11/34 computers, which manage the movement of parts, and depending on needs, transmit programs to the machines' numerical control through the CND system. But Sergio Romanini, responsible for Comau's flexible shops, emphasized the importance of computer simulation techniques in the design of such shops. "These programs are indispensible for optimum use of the various elements of the production system, because they allow adjustment of the major parameters: number of machines, number of pallets, speed of conveyor systems, and part dimensions. The computer makes it possible to make the best choice, and above all, to evaluate the flexible shop's productivity variations in cases of machine or component breakdown."

This opinion is fully shared by the staff of Automatique Industrielle of Suresnes, which has computer-simulated the future shop of Citroen Constructions Mechaniques intended for the Meudon prototype plant. This work has made it possible to precisely determine its configuration: it will include three machining centers, an automatic gauging machine, a surface treatment machine, an automatic 600-tool magazine, four loading and unloading stations, and will produce engine model parts (heads, gear boxes, and differential and clutch housings) in small runs of approximately fifty pieces.

This installation should start operations during 1983, which is one year later than the extraordinary installation which is being started at Renault Vehicules Industriels, in Boutheon. "This is a shop that is at the cutting edge of world technology," states without hesitation Catherine Dupont, who has worked at Renault

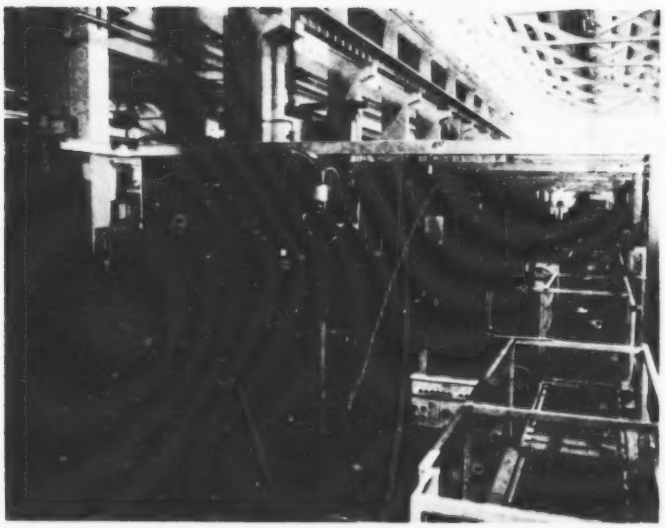


Layout of the Maserati flexible shop in Modena. The 10 machining centers produce 30 engines per day in two shifts.

Machine-Outils (Machine Tools) on the software for the shop. The original feature of this installation is that its real-time management practically eliminates stocking and work-in-progress. All the pieces machined during one day are assembled the next day in the same plant. The Renault shop will machine only the parts required for assembly, and will constantly adapt (in real-time) machining to manufacturing needs. The anticipated production is 100 gear boxes per day in four machining centers, with three special machines, a washing station, and 10 wire-guided carriages. The whole will be also managed by two computers, which will determine the pallet traffic and machine control.

But all these installations are still considered to be too large and too expensive by many enterprises, which prefer to approach manufacturing automation in stages. The first of these stages is the flexible manufacturing cell, which generally combines a robot and two or three numerical control machines. Many machine builders, such as Jobs, Comau, Asea, and DEA, have already constructed some of them.

The production island installed by Jobs at Car-Bench in Massacarraro, is a fine example of the automation of a group of machines. Its task is to machine a line of beams for garage lifts, which are 1-1.4 m long and weigh 48-60 kg. The island was assembled from two existing machines (a milling and a boring machine) and a JOB'OT 10 robot. The latter picks up the parts from a pallet, presents them to the two machines, deburs them at the end of the cycle, and loads them on pallets before they are moved to the surface treatment station. "The parts are machined at the production island without any manual intervention," points out Antonio Dordoni of Jobs-Quota. "Car-Bench was thus able to double its production with a 70 percent investment savings, an 80 percent manpower costs reduction, and a 50 percent gain in floor space."



Flexible shop built by Comau for the Iveco plant in Brescia: 220 parts per day, produced with 12 machining centers.

Flexible Cell Concept Applies Not Only to Machining

Asea has applied the same principle at its plant in Vasteras, Sweden, for the printed circuit manufacturing shop. "This island is particularly interesting," states Johan Halling, Asea director in Vasteras, "because it operates 3 x 8 in eight-hour periods without operator control, and especially because it is supervised by a computer and integrated into a complete system for computer-assisted design and fabrication (CAD/CAM). The industrial robot prepares the stacks of interleaved and printed circuit cards by drawing from various magazines, loads and unloads the two numerical-controlled drilling machines, changes drills, removes finished parts, and so on."

Similar applications were described during the conference, notably by Comau, which has two pilot flexible cells, one in its Turin plant (brake disk machining, loaded by robot), and the other in Modena, where a robot connected to two numerically controlled lathes changes parts and replaces cutting tools.

But the flexible cell concept does not apply solely to machining. For instance, DEA Automazione, a manufacturer in Moncalieri (near Turin), has sucessfully installed 22 systems for assembly and automatic control with robots. Among the most recent of these, are those for engine head assembly (valves, springs, and rocker arms) at Comau, which uses four manipulators, and those for electric motor assembly at Ibimei (13 parts to be assembled) at the rate of 150 per hour.

Machine-Tool Builders Equally Interested

The development of flexible shops and cells is of interest to machine-tool builders as well as to the manufacturers of numerical controls, who must design equipment and software adapted to these new forms of production. Such is the case of ECS in Florence, which has developed a number of computer programs: a machine program called Main, a program for machine diagnostics and configuration, and so on. Similarly, Num SA has perfected flexible shop options for its CNC 640: choice of programs (256K-word memories), tool management (wear, working time, and presence control), parts and base-line measurement by means of sensors, and so on. Moreover, Num has perfected a direct numerical control system capable of connecting 16 numerical control machines to a central unit. Several applications are being developed at Renault, Peugeot Cycles, Citroen Meudon, and Snias Marignane. At the same time, one of the large European specialists, Elsag, has developed special modules for its numerical controls. These combine the necessary software and equipment for unsupervised operation: part control modules, tool control, power monitors, and so on. And for the more advanced systems, Elsag has devised a direct numerical control architecture to guide several numerical control machines. It is presently undertaking two installations at Leroy-Somer in Angouleme, and at Gilera, in Arcore (Italy).

11,023
CSO: 3102/235

FRANCE ENTERS COMPETITION IN CARBON FIBER INDUSTRY

Paris INDUSTRIES & TECHNIQUES in French 20 Feb 82 p 10

[Article by Alain Perez]

[Text] Five hundred tons per year in 1985; two producers for a strategic material that is still very expensive.

On my left, Elf with 250 tons. On my right, Puk with 200 tons. For France, 1981 will remain the year of the carbon fiber. One after the other, these two groups announced their plans: by 1985, we will thus have gone from nearly nothing to nearly 500 tons per year. "Not one gram of foreign fiber will come into France," they say at the Ministry of Industry. "The users will have to play the game."

The two future competitors have solid allies: an American and a Japanese one for each. On the Elf side, they are playing the Union Carbide/Toray card. At Puk, they are betting on Hercules/Sumitomo. Two three-way unions for a European market that has not really been opened yet. The large users are not so sure that the two trios will make it all the way.

Under the Eye of the Ministry of Defense

The Ministry of Industry is responsible for this frenchification. "We had established the rules of the game. We had two suitors. A ruling in favor of one or the other would have been inexplicable." The Ministry of Defense, very concerned by this "very strategic" material, followed the negotiations from the start, but for the time being the independence will remain only partial.

In both cases, the polyacrylonitrile (PAN) will be supplied from Japan by Toray and Sumika (Japanese subsidiaries of Hercules and Sumitomo). An eventual know-how transfer is anticipated for this indispensible basic fiber. The two agreements are valid for 10 years. They theoretically give the two French groups complete access to the American and Japanese technologies. There are already several big losers in this matter: first, Serofim, the only current French producer, which will be reintegrated into the Puk fold; second, Rhone-Poulenc, which vanishes completely from this field. This French company now seeks to catch up by associating itself with a partner, to produce in France an aramid fiber complementary to carbon fiber: made-in-France Kevlar could soon see the light of day.

Another loser is the English company Courtaulds, inventor of this material, "which did not know how to carry out the negotiations." And finally, the Ciba and Hoechst groups are also in the race to acquire one of the famous licenses. There is neither chance nor kindness in these implantations. France is the largest consumer country in Europe, with 40 percent of the 200 tons currently being used each year. According to GIMAC (Interministerial Group for Composite Materials) estimates, this figure should triple by 1985. The Elf project forecasts a minimum production of 250 tons per year toward the end of 1985. The plant would be located in the Lacq region, near the large Bordeaux manufacturing centers (Snias, Sep, Dassault). A late starter in the race, Puk is making very good time. Its project should be completed at the end of 1983, probably in the Lyon region. The cost of each unit is estimated at 150-200 MF. A PAN production plant would cost five times more, but both sides strongly believe in it. "It's an act of faith," indicates Bruno de Vulpian at Puk. "It's a bet on the future," thinks Mr Kaelin of Elf. Puk already has some carbon product experience, notably through Serofim. Elf is starting from scratch in fibers, but does know resins, which are completely indispensible.

The users hold the key to this double bet, and they are essentially the large aeronautics firms. Snias' bonds with Puk are long-standing, and the arrival of Hercules, titular supplier for Boeing, is favorably received. A "diplomatic" action is also being undertaken with the other large European customers (Enka, Aeritalia, Ciba), the aim of course being to convince them to buy French. Here again, Puk has a small advantage thanks to its knowledge of aeronautics circles.

In fact, and independently of the outcome of these projects, the size of the French producer or producers will remain modest. In 1985, Union Carbide, Toray, Hercules will grow beyond 1000 tons per year. And this does not even take into account Toho, Celanese, and Nippon Carbon. The world market is already overloaded. How will it be in 1985?

Aeronautics First

In any case, the penetration of carbon fibers into aeronautics seems to be inevitable. Boeing forecasts that during the 1990's, commercial jets will require high performance composite materials for 60 percent of their weight. The substitutions will occur at the expense of aluminum.

The other large sector is automobiles. Very little is going on for the time being, because the price is prohibitive. However, the upper limit estimated by GIMAC for Europe's consumption is 1200 tons per year, assuming that usage in automobiles begins earlier than predicted.

Things probably will not really get underway before the 1990's. The other sectors (sports, leisure) manage very well with a lower quality but definitely less expensive fiber, made from resin or rayon.

The whole problem lies in the fabrication process. The PAN approach yields very expensive, high-quality fibers (300 F/kg). To generalize the use of this material, the price would have to be divided by 10 or 15. All the participants will not be able to engage in the coming price war. Recently, a Japanese laboratory presented a promising original process: it is an experimental gas-phase technique (benzene cracking and crystal growth on a metallic seed), which eliminates all the complex operations of carbonization and drawing. The history of French carbon fibers is only beginning, but the Americans and the Japanese are in clover.

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CSO: 3102/237

SECOND-GENERATION ROBOTS APPEAR ON SCENE

Paris INDUSTRIES & TECHNIQUES in French 1 Mar 82 p 10

[Article by Jacques Houbart]

[Text] They are Characterized by New Visual and Tactile Capabilities.

The second generation robots that are now appearing on the industrial scene are characterized by new visual or tactile capabilities. These advances in sensing abilities were pointed out by Mr Parent, of the Agence de l'Informatique, during a conference on Industrial Applications of Artificial Intelligence (CERN, Geneva).

American and French in the Lead

As Mr Parent stated just before his departure for Geneva, "the current leaders are a few American and French teams. Following the Unimation research, Automatics has perfected seeing equipment, notably for Asea. In France, an Acma robot can already locate and grab a crankshaft from a semi-jumbled pile on a pallet."

At Souriau, a three-fingered hand is equipped with tactile sensors, the tactile sensing being transmitted by fiber optics. Programming advances explain the observed entry into the field of robotics, of such companies as TITN, GIXI, or Adersa-Gerbios. The recourse to programs using sensor data justifies GIXI's ambition to create universal robots.

At Adersa-Gerbios, the gains made in the vision domain are being fully exploited. A digitalization of the video image pretreats the scene by selecting the essential features of the information. "We are striving," says Mr Roux, "to design equipment competitive in price, which will be used in industrial work stations, and notably a device that will enable the control of a robot arm as a function of the shape of the parts being identified."

This enterprise is developing a system for automatic recognition of large beef carcasses; the objective is to automate the carcass classification station by eliminating subjective criteria. Another program uses the machine's ability to "see

the human eye" and therefore to recognize the texture of a subject's iris. This leads to the possibility of recognizing man's "iris print" in the same way as a fingerprint. Applications are already being envisaged to protect certain security areas.

Rapidly moving through the chapters of classic physiology, robotics is already advancing beyond the stage of sensing and perception, and an entirely different robotics--without information feedback--appears on the horizon. At that point, the machine will be loaded with a data base--in welding, for instance--and depending on other memorized knowledge, will be able to perform a number of tasks. But it is probable that in any case, the sensing ability of the new machines will always be brought into play.

In addition to Mr Parent, the Geneva meeting was also attended by H. Gallaire (CGE-Marcoussis), R. Prajoux (LAAS, Toulouse), Mr Burnod (SPS Division, CERN, Geneva), J. P. Haton (University of Nancy), J. Potage (Thomson-CSF, Gennevillers), J. L. Lauriere (University of Paris VI), and A. Bonnet (LRI, Orsay).

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CSO: 3102/236

ROBOTICS PLAN LAUNCHED WITH MEETING OF USERS, MAKERS

Paris L'USINE NOUVELLE in French 8 Apr 82 pp 59-60

[Article by Georges Le Gall: "The Robotics Plan Begins Today"]

[Text] Users and manufacturers have just met. Thanks to this concerted action with the industry, the government will be able to settle on the action programs which could be implemented before the end of this year.

The day of April 8 could be considered as the true starting point for the implementation of the robotics plan prepared by the Ministry of Industry: this is the day on which representatives of the industries that use and manufacture this equipment are meeting. They will then break up into eight specialized workshops: textiles, garments, footwear, mechanical wood processing, furniture, plastics and rubber processing, paper processing, and ceramics. It is possible that other groups will be formed subsequently, notably for agricultural food products.

Each group (which includes 20-40 persons, most of them industrialists, but experts as well, primarily from professional technology centers) will have to produce a report before the summer vacation. In addition, a general report will be written by Jean-Claude Touret, of Bipe (Office for Economic Forecasting Information).

The robotics task group created at the initiative of the Ministry of Research and Technology, must also draft a report by the beginning of summer, and will associate itself with the work being carried out by the Ministry of Industry through its chairman, Maurice Petiteau, chief executive officer of Sormel.

The government has two goals: encourage the manufacturing industries to invest massively in automatic equipment (and not only robots in the strict sense of the word), so as to strongly bolster their productivity and thus be able to improve their share of the market both in France and abroad; and at the same time, facilitate the development of a strong French industry in the new equipment sector formed by automation.

Automation: 17 percent of French production investments (in million francs)

Type of system	AA	BB
Industrial process computers	1,600	800
Machine tools	3,700	500
Machines for agricultural food products	3,000	200
Various industries (textile, shoes, printing)	3,000	200
CAD/CAM	200	200
Maintenance equipment	4,000	150
Assembly, packaging	1,500	150
Plastics and rubber	700	100
Robots	100	100
Foundries	400	50
Various (including engineering studies)	1,400	1000
Total	19,600	3450

AA = Total investments
BB = Investments in automatic equipment and software

This means amplifying and systematizing, both in demand and supply, the efforts that have already been undertaken by the previous government (notably, at the beginning of 1980, the creation of the Committee for the Development of Strategic Industries, which has aided the introduction of flexible shops and the implementation of the Meca procedure to encourage the acquisition of advanced design machinery and equipment) and by the present one (with programs covering machine-tools and the textile industry).

Profusion of Agreements Between the Giants of International Industry

According to an ADI (Agency for Computer Development), the French inventory of robots of all types amounted to about 39,000 units (17,000 in the automobile industry alone) at the beginning of this year. The manufacturers have recently become aware of the usefulness of developing a structure to coordinate innovation in the automation domain, where demand is expected to grow steadily at a rapid rate (on the order of 30-50 percent per year). This has led, in October 1981 under the sponsorship of the Federation of Mechanical Industries, to the creation of Girma (Interunion Group for Robots and Automatic Machines); and in February 1982, to the formation of Afcomis (French Association of Designers-Manufacturers of Special Machines and Installations).

The most recent months have seen a profusion of robotics agreements among the giants of the international industry: Volkswagen-General Electric, Olivetti-Westinghouse, Kawasaki-Unimation-Asea, IBM-Sankyo Seki, General Motors-Fanuc, and so on.

Faced with dealings of this magnitude, the French will be forced to reexamine the credits they allocate to automatic devices (a total of 251 million francs in 1981, consisting of 91 million for research and development, and 160 million for implementation aid); and to specify the role they want to assign in this area to such large national enterprises as CGE, Dassault, Matra, Renault, Saint-Gobain, and Thomson.

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CSO: 3102/236

CREUSOT-LOIRE: HIGH-QUALITY AERONAUTICAL STEELS, LOWER COST

Paris INDUSTRIES & TECHNIQUES in French 20 Feb 82 pp 94-95

[Article by Jean Nenin]

[Text] Remelting under slag with the performance of vacuum remelting, for safety parts.

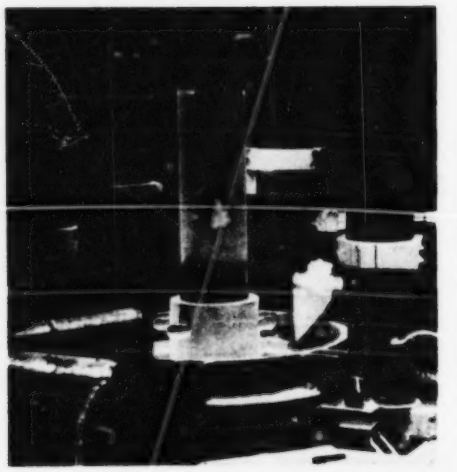
The formulation of special steels in electric furnaces has evolved greatly during the last few years: very low sulfur (less than 40 ppm) and hydrogen (less than 2 ppm) contents, inclusion purity improved by the use of slag and passivation processes specially adapted to the reduction phase of the operation, deoxidation with carbon in vacuum, and so on.

However, despite these improvements, it has remained necessary to use remelting processes in vacuum or under electrically conductive slag (VAR and ESR) for applications that require a very high level of reliability or severe service conditions. This is the case of the airplane industry in particular. The VAR process was the first to attain the "very high quality" (THQ) level, with the ESR process being used only to obtain very low sulfur contents and improve inclusion purity under the most economic conditions.

The Pamiers company of Creusot-Loire had set itself the objective of reaching this THQ level with a single ESR remelting, when only the VAR process appeared to guarantee it. They have achieved their goal in the form of a qualification and fabrication of the essential parts for the Airbus A 300 and A 310 landing gear, using 35 NCD 16 steel.

The process is characterized by the remelting of an electrode through a slag layer, which allows a purification of the molten metal drop by drop as it passes through the slag, and which results in a surface condition that avoids scaling. The furnaces of the Pamiers plant currently make it possible to produce three types of ingots without change of electrodes: 4 t squares (450 mm on a side), as well as 10 t and 30 t cylinders (700 mm and 1100 mm in diameter). The latter can reach 33 t by changing the electrode during remelting.

Airbus landing gear made of 35 NCD 16 steel obtained with the ESR-THQ process (Documents Loire).



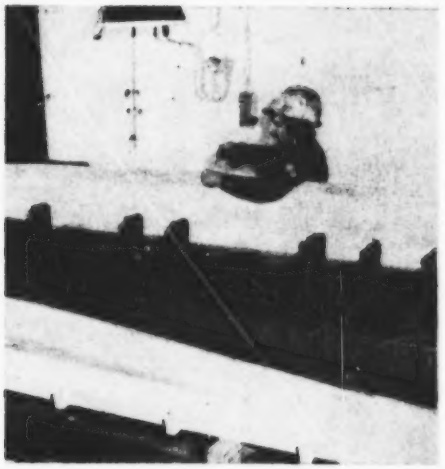
A 30 t ingot of QAS or THQ quality, obtained from the remelting of a single electrode.

Two levels of quality can be obtained depending on the performance expected of these remelted steels: standard aeronautical quality (QAS), which represents the best cost/safety compromise, and whose cross-sectional properties take priority; and very high quality (THQ), needed for particularly stressful applications, which require a high level of fatigue resistance, as in the case of landing gear parts, for instance.

Constant Mechanical Properties

In general, and within any one level of performance, these two qualities offer a chemical composition homogeneity reflected in constant and isotropic properties, and in a structure in which regular crystallization without axial segregation over the entire length of the ingot, results in excellent transversal ductility and good resilience at all points. The ESR process developed here controls the proportion and distribution of non-metallic inclusions, and leads to a purity level comparable to that obtained with the VAR process. And finally, the skin quality of the ingots allows a direct processing without preliminary preparation for stamped or pressed products, thus reducing the cost of these operations.

The THQ level for safety parts that undergo high static and dynamic stresses, was required for the 35 NCD 16 steel in the fabrication of essential components in the landing gear train of the Concorde, and eventually of the Airbus A 300 (framework, trailing bar, articulation arm). It is characterized by a highly homogeneous chemical composition: for a 10 t ingot, for instance, analysis spreads between the top and bottom of the bar must be below 0.03 percent for C, 0.05 percent for Si, Cr, and Mo, and 0.10 percent for Mn and Ni.



This 440 kg spar mounted on the A 300 and 310, is made from 40CDV12 obtained by the ESR-QAS process.

Controlled PPM

Also required are a very low content of sulfur (less than 30 ppm; the Bauman macrography must be absolutely virgin) and phosphorus (less than 100 ppm), and a controlled content of trace elements: less than 100 ppm As, 500 ppm Cu, 50 ppm Sn, and 15 ppm Pb and Sb.

The total inclusion count must be very low: after a 40-field count performed according to the ASTM E45D method, the weighted sum A+B+C+D must be lower than 20, with limit index values for each type being 1 or 1.5.

And finally, the magnetoscopic property evaluated according to the Air0819 standard, must fulfill class 4 criteria.

At Pamiers, this level of quality was obtained (with, in addition, a sulfur content lower than 20 ppm, and inclusions smaller than 12 microns, all of them of type D) by acting simultaneously on the conditions of the mother run and the remelting parameters. The remelt rate is automatically controlled by a computer which takes into account the current, voltage, instantaneous weight of the electrode, and so on, resulting in a perfectly reproducible process and guaranteeing a regular solidification. The choice of slag also plays an important role, as does the control of its humidity and that of the atmosphere, so as to avoid any hydrogen recapture.

While the THQ steels represent the top of the line, those at the QAS level provide a broad range of possibilities for other safety parts, despite a slight reduction in performance and maximum specifications. The maximum size of inclusions is 15 microns, and the weighted sum for the ASTM E45D method must be less than 35.

ESR-QAS remelting is thus a means for protecting against the random or accidental presence of critical size inclusions, due for instance to entrainment of refractory materials, whose absence cannot be quaranteed by any arc furnace fabrication, no matter how advanced. The ESR-QAS quality was used to make the construction components of the engine support pylon for the Airbus, using 40 CDV 12 steel: the ribs under a 65,000 kg hammer, the lower spar with the interforge press, and the lateral 14-mm thick plates, in the Creusot mill.

11,023
CSO: 3102/242

BILLION: EUROPEAN LEADER IN PLASTICS-PROCESSING EQUIPMENT

Paris INDUSTRIES & TECHNIQUES in French 20 Feb 82 pp 23-25

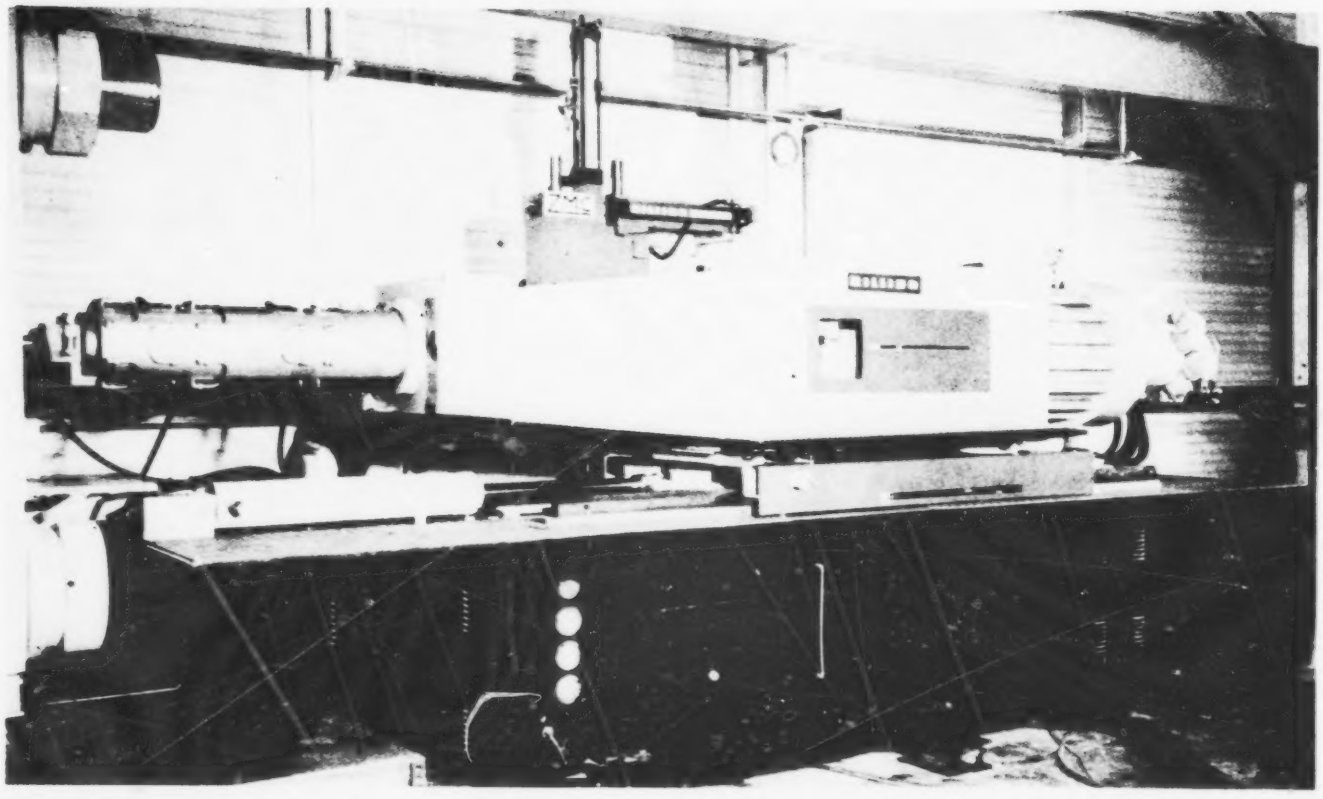
[Article by Christian Guyard]

[Text] Doubled production capability and modular design: Billion's aim is to be in first place as European builder of injection presses. From 90 t to 10,000 t, integrated hydraulics and adapted automation.

"Whether the part weighs two grams or 170 kg, we have a machine capable of fabricating it. Our business is the injection of plastic materials: thermoplastics, thermosetters, reinforced or not. We know how to process." Jean Laurent, director of SMTP Billion is quite self-assured. It is true that for the past 15 years this enterprise has been a pioneer in the automation of injection presses, and that it intends to continue to be among the leading European and world builders of such machinery. To justify this ambition and reinforce its position on the international market, Billion has just gathered all its production resources at the Bellignat location, near Oyonnax. Production capacity has just gone from 300 to 600 machines per year, and expansions are planned to bring it to 1000 units per year. The new plant was built in no more than six months: when you belong to the Saint-Gobain Pont-a-Mousson group, everything is possible. Thanks to this, for instance, it carried out the study and construction of a 10,000 t press.

But Billion also sought to avoid sterilizing its creativity when it became a subsidiary: the Billion autonomy and spirit still exist; its research policy and its--at times original--means of production testify to that. This uninterrupted research explains the perfect match of machines to users' needs (modular line), the solving of such difficult problems as the 10,000 t press (25,000 hours of design), and the development of the Visumat and Ordimat systems, as well as the ZMC process. The latter is a revolution in the injection of thermohardeners reinforced with long glass-fibers (25 mm and more).

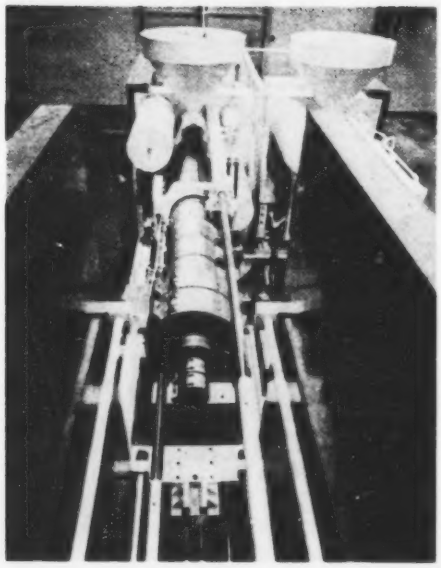
The process responded to the needs of automobile manufacturers, who are forced to reduce weight by substituting plastics for metals. But the automobile industry makes stringent demands on production rates, appearance of parts, and painting. The approach that met the production rate and price demands was injection. As Jean Laurent points out, "ZMC is not merely a logo. It is first of all, and unlike the other processes, a brand name. It is also a resin which withstands the drying conditions for conventional paints (3 h at 180 degrees C), a patented machine, and



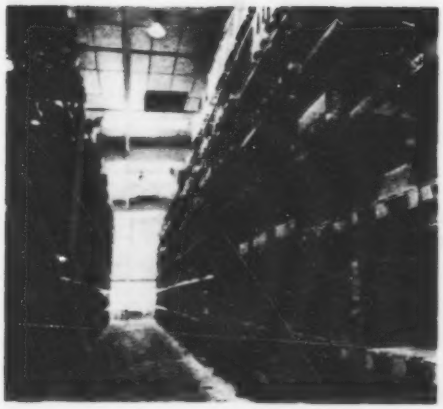
The ZMC process revolutionizes the injection of thermohardeners with long glass fibers. It fully meets the specifications of the automotive industry: mechanical properties, drying conditions, rate, price. (Documents Billion).

of course, a mold guaranteeing the quality of the fabricated parts." While Billion is the builder of the system, its collaborators have come from many areas: Vetrotex for the glass fibers, Air Industrie for painting problems, and so on. Today, the process is perfected, and two machines of 2500 t and 140 t are under development. But the process is also compatible with all the other presses of the company. Car body parts are currently being tested, and several French mass production models should soon be built with them.

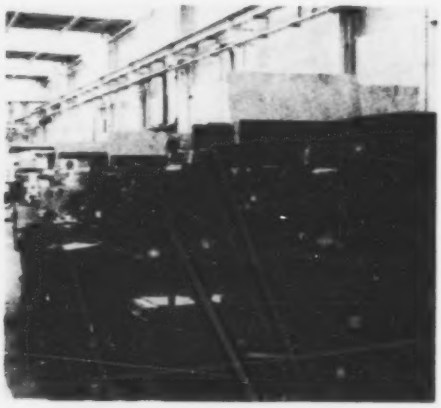
Compared to conventional injection machines, the ZMC has original features which avoid any fiber degradation. The loading hopper is equipped with a pusher system which feeds the screw and assures a constant rate of plastification. The material is introduced in the form of SMC, BMC (shreds), or direct incorporation of the load in the machine. The screw is mounted inside a sleeve which retracts with it, thus defining the volume of materials to be injected. Injection occurs through advance of the screw-sleeve assembly, at rigorously controlled speeds and pressures. The flow rate can thus change from 0.1 to 2 l/sec in a single cycle. Any backflow of the materials in the screw is impossible, even though the injection pressure reaches 800 bars, a value which is essential for a good surface finish. For specific parts,



The frame design changes the concept of high capacity machines.

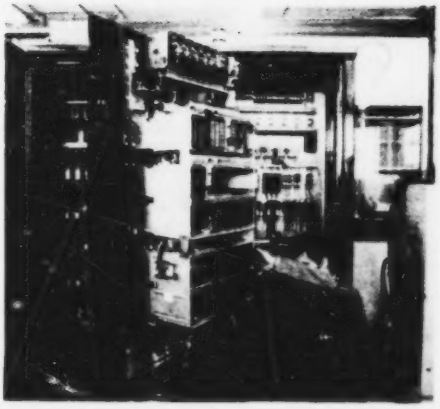


Individual storage of parts: 10 tons, 7-meters high, 50,000 computer listed items.



Manufacturing lead time for a machine will soon go from eight to seven months.

however, the machine can perform in injection compression. The materials are introduced into an incompletely closed mold, where they penetrate more easily. The fibers are handled in the same way as the mold zones that are sensitive to abrasion. When the mold is filled, the shut-off is complete and high pressure is assured. The mold temperature reaches 200 degrees C, thus requiring mechanical extraction. The extractor, as well as other peripheral devices, are controlled by the Visumat system.

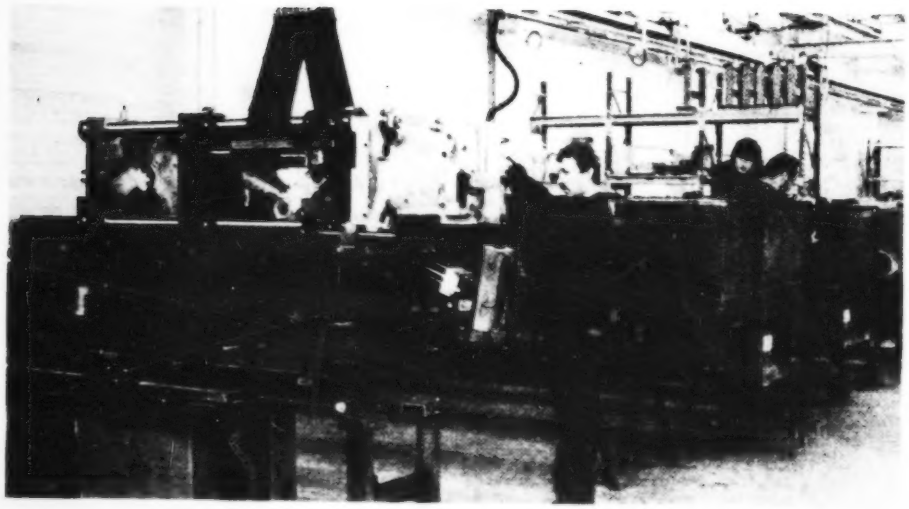


Electrical panels and cabling are pre-assembled and tested before final assembly.

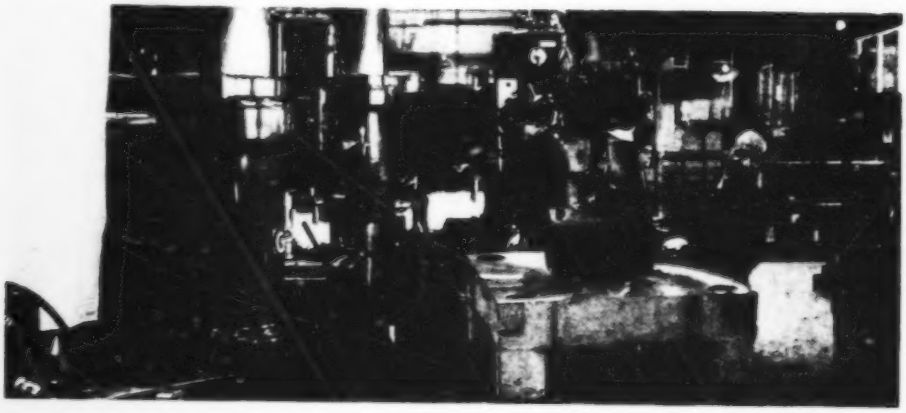
Integrated hydraulics, pressure accumulators: time-tested solutions.

Another innovation, and not the least of them, is the 10,000 t pressure press. Its origin is connected with the problem of a customer, who wanted a machine with minimum platen flexing. The conventional column system led to extraordinary thicknesses of mold-mounting platens, since the stress is supported very locally: this led to the idea of distributing it over the entire width. The result was a evolutionary design, very original solutions, and 500-mm thick platens, which is three times less than for the column system. A computer was used to design the structural elements. The project was firmly handled, requiring only one year between the decision to build and the completion of the assembly. Eight frames of increasing thickness surround the platens. The clamping mechanism uses the Billion technique of mechanical jamming and hydraulic locking, which is provided by eight 1250 t rams. The mold guidance function is assured independently of the pressure by machine-tool type slides located above and below. The molds, whose thickness ranges from 1.90 to 2.40 m, are installed by rolling on one side and lifting with hydraulic rams. The heavy-weight bridge is thus eliminated. The parts are also removed laterally. For injection, this 30 m-long monster accepts up to three different units, making it possible to simultaneously produce several parts or one multi-material one. Operating so far are only two machines of 10,000 t and 5000 t. But the system is promising, since a feasibility study for a 50,000 t machine has already been completed.

In this pursuit of hugeness, the company executives are not forgetting that machines of less than 300 t represent 90 percent of the world market. This has led them to rationalize production and offer a new modular line which covers all the equipment from 50 to 10,000 t. Thanks to this and with a minimum investment, the user has access to sophisticated tooling and highly diversified materials. Three injection units and four platen dimensions are available for each pressure. The assemblies reflect the separation of the line into two ranges, 50 to 450 t, and greater than

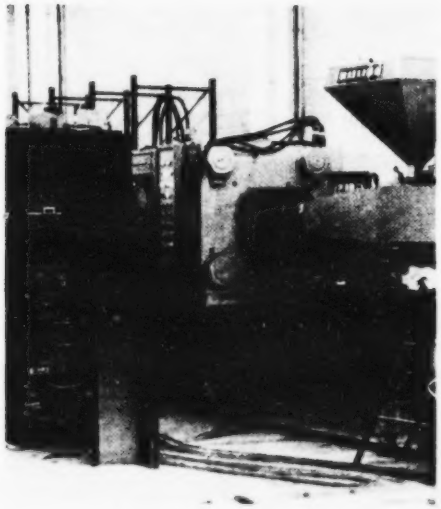


The modular line consists of subassemblies. One machine can receive various injection units and four platen dimensions.



The majority of parts are machined on numerical control machines. Threads are cut on in-house machines.

650 t. The equipment is built from subassemblies which are put together on two parallel lines. The mechanical, hydraulic, and automation portions are prepared separately. After mounting on standard frames and painting, the equipment is moved to final cabling and testing. The machines are received by customers at the plant; they require 8-9 months for construction. This will be reduced to seven months when supply logistics will be entirely computerized. The plant presently produces 30 units per month.



After assembly, the machines are received by customers at the plant.

In the research department, the next ten years are being planned in secret.

Subcontracting is important. The sheet-metal department is almost eliminated, and all thermal treatments are performed on the outside. On the other hand, the machine shop plays a primordial role: it produces the screws, sleeves, rod bearings, and injection heads. The latter, made of GS cast iron, are particularly important because they form the bored block for the integrated hydraulics. The screws, with diameters of up to 200 mm and lengths of 4 m, are machined in-house. Higher dimensions are handled by the SMTP plant of le Havre. Depending on complexity, 3-10 passes are necessary for completion on machines designed at Billion. The sleeves are bored from bars; the boring length is about 25 diameters. Some sleeves are bimetal, with a hard inside case, which gives them a long lifetime. The heaviest parts are the platens, which are made of forged steel. The largest borer (a platen can have as many as 180 holes) can work over an area of 2.5 m by 5 m. The machines are French and are generally numerically controllled.

The automation shop, which has some 50 employees, produces the electrical equipment. To save time, the bundles of cables (spiders) are prepared on boards specific to each machine: one for the injection, the other for the closing. The various electronic circuit boards, designed by Billion, are essentially subcontracted. Once assembled, the racks are bench tested by simulating the machine's functions with small pneumatic rams. This test is recorded and kept until the machine is received. Machines larger than 650 t have Visumat as standard equipment. This is a system whose success is unquestionable: more than half of the customers request it when offered as an option on the smaller presses. All parts, except the very large ones, move through a storage warehouse, where 50,000 items are managed by a computer. Parts or subassemblies are stored at the plant, on seven levels of pallets: 10 t stacks, 7 meters high.

This production organization is based on two key services: the mechanical and hydraulic design department, and the center for applied testing and research. The design department, which will soon be equipped with CAD, has 25 employees. The hydraulics aspect is primordial, because there would be little use for electronic speed if the hydraulic rams cannot follow it. Integrated accumulators and hydraulics are conventional.

The testing center is part of Billion. To manufacture a part means to assemble a processor, a mold, and a material. Delicate technical problems are solved in this shop. At the research center, discretion reigns above all. That is where today's successes were once developed. New automatic devices are being studied at present, and the only certainty is that the plans must be made for the next ten years.

11,023
CSO: 3102/242

FIRST ROBOT MACHINING CELL FOR SMALL FRENCH FIRM

Paris INDUSTRIES & TECHNIQUES in French 1 Mar 82 pp 25-27

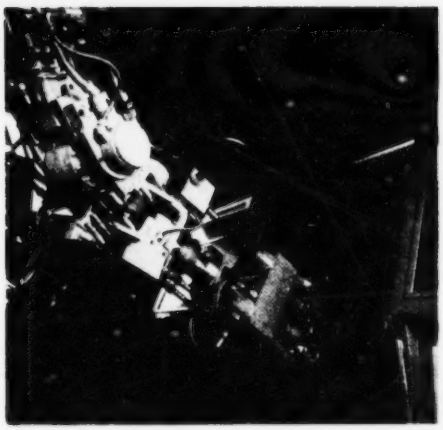
[Article by Andre Larane]

[Text] Robots work and they are profitable. Sahl Leduc proves it with a turning and milling machining cell. As simple as a machine-tool, robots nevertheless require a lot of skills.

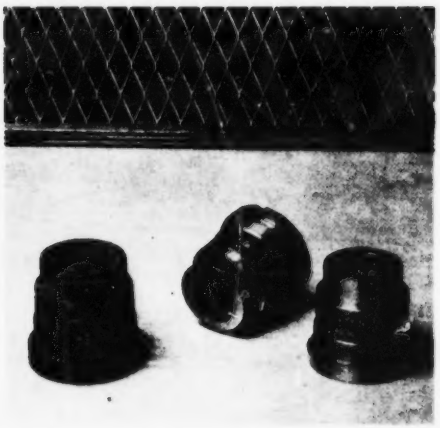
In 1976 the Sahl Leduc company, a PME (small and medium-size enterprise) with 80 employees specializing in the fabrication of hydraulic jacks, received its first numerical control (NC) lathe. In 1981, with 180 employees by this time, the company, in Niort-sur-Erdre, Loire-Atlantique, has 12 NC machines and a robot machining cell for turning, the first one installed in a French PME. Although numerical control has improved the hiring situation, the purpose of this robot and of those which will soon arrive, is primarily to improve quality, costs, and productivity, while raising the level of responsibility of workers. "Investing in robotics is to comply painlessly with the regulated work hour reductions," points out Joel Leduc, manager of the enterprise.

This observation is current and has no futuristic overtones. For almost six months, the articulated arm has been servicing seven work stations with clockwork regularity. Occasional breakdowns of microelectronic components have nothing in common with the problems experienced by some industrial groups that have engaged in similar adventures. Quite honestly, we must admit that at the time of our visit, the only problem encountered was associated with some program sequences in the control unit detached from the machine, which made it necessary for the supervisor to temporarily return to manual sample control.

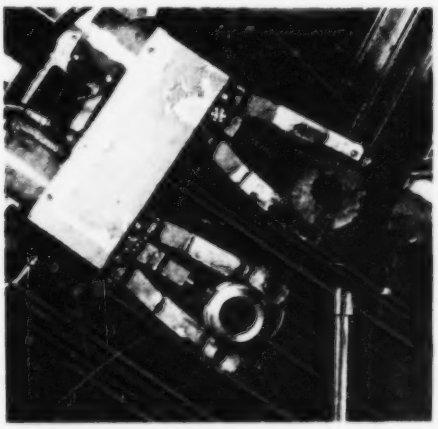
This drawback is largely compensated by the operation of the installation during two shifts (including breaks), namely a full 16 hours. Eventually, it will machine 21 hours a day, and if the work load demands it, will be able to also work during holidays without major handicap for the personnel. Only one attendant is needed for monitoring, loading rough parts, and small adjustments. Formerly, one full-time operator was needed for each of the two HES Transnum NC lathes, while two part-time workers took turns on the milling-boring machine and control. The total manpower gain is nearly 75 percent! The workers have therefore moved toward other sectors of the shop, or toward the methods department.



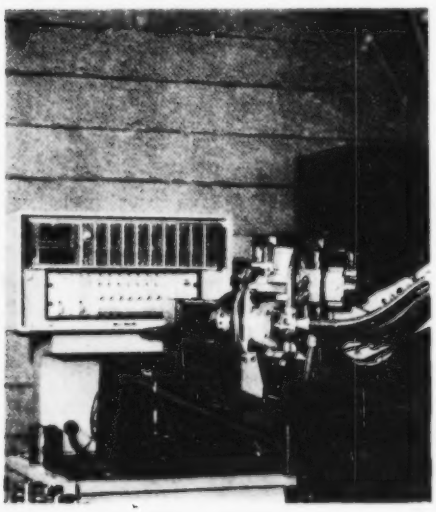
An NC lathe is part of the cell. A piston grasps the part.



Seven stations for turning, milling, and quality control of the rings.

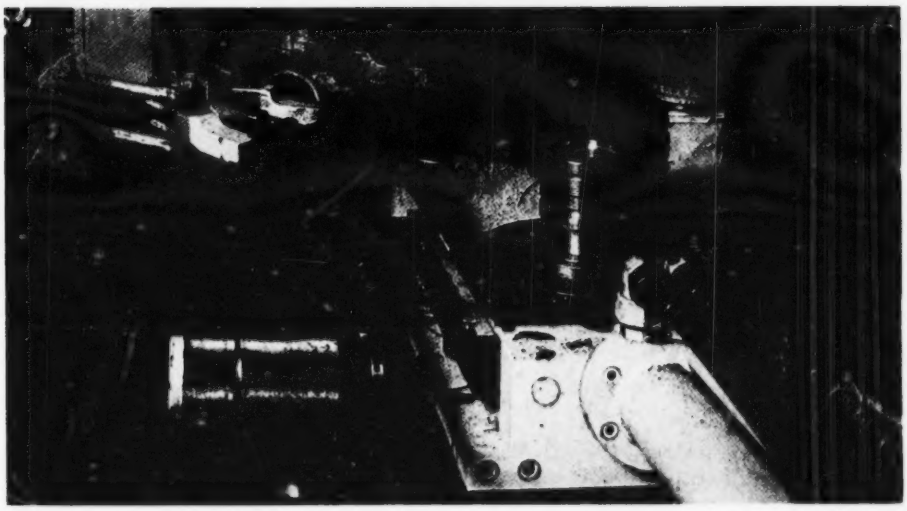


A hand for two parts: loading the rough part, and removing the finished one.

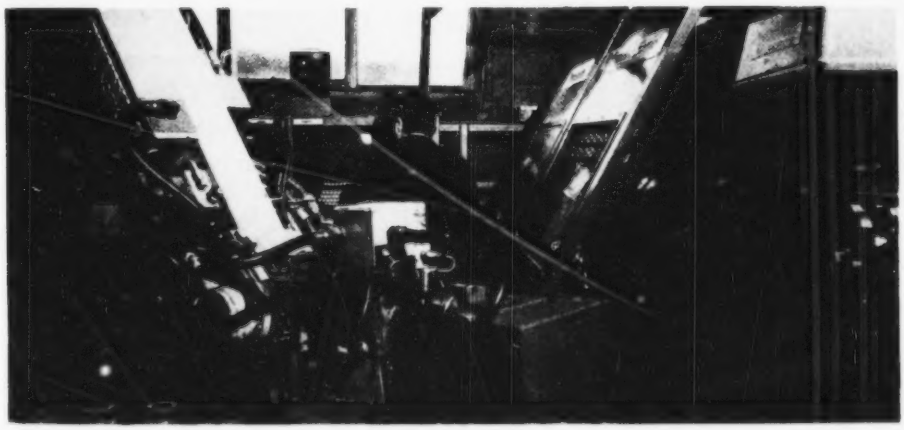


Electronic control and analysis of measurements for tool correction.

The pace of the work is impressive: the cell produces 20 parts per hour, compared to 15-17 with CN. Quality is improved thanks to unified control, which will eventually be complemented with the printing of a certificate of conformity. Once the robotized assembly is available, this procedure is no more difficult to implement than an ordinary sampling quality control.

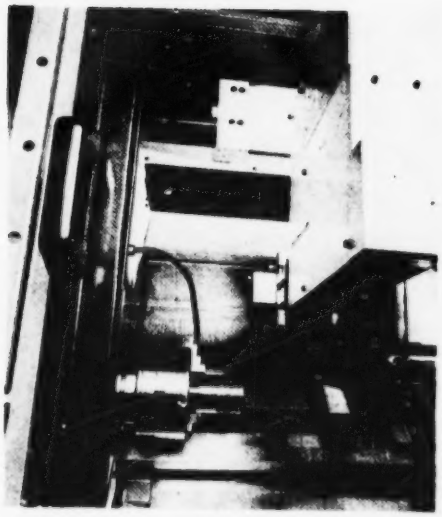


After turning, the part is brought to a small milling station by an automatic platform. Since the operation is very brief, the robots waits at this location.

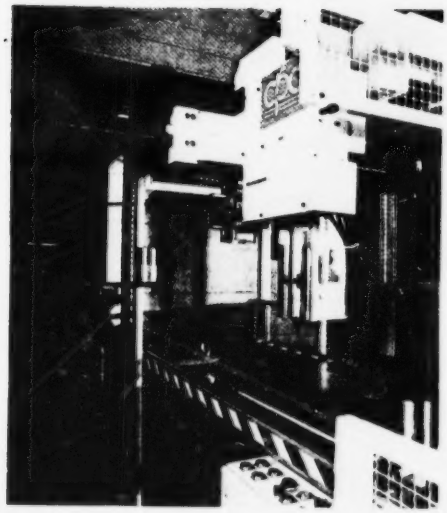


Supervision of the robot requires technicians, and a knowledge of mechanics, electronics, and computers. The majority still lack this training.

The Sahl Leduc (Societe d'Applications Hydrauliques Leduc) cell is designed for a family of guide rings weighing about one kilogram, with a diameter of 50-100 mm. These are short shapes of revolution, of rather high precision (on the order of a hundredth of a millimeter), threaded, bored, and grooved. Rough parts are picked up from the palletization station by the hand of a Cincinnati T3 robot. The latter is capable of handling a 45-kg part along six degrees of freedom and 240 degrees of circumference, maintaining a positioning accuracy of 0.5 mm even at 2.40 m from the central pivot.



Lathe with integrated robot. A cell alternative for simple parts.



The robot's value depends on its autonomy and storage capacity.

The part is brought successively to the two lathes, and is carried by one of the robot's hands. The other hand removes the finished part from the lathe. Each is cut and finished on the outside, on the throat and the bores, then threaded. Afterwards, it is sent to the milling machine and two chip blowing stations. It is essential that the part be absolutely clean before reaching the automatic gauge. Six to eight dimensions are measured with several electronic sensors. If the dimensions are out of tolerance--"which occurs much less than once in one hundred," according to Christian Leduc, head of manufacturing--the robot places the part on the ground; otherwise, it places it on the outgoing pallet.

But the control machine also serves to detect tool wear, based on dimension variations. It transmits its analysis to the lathe's computer, which then corrects its program so as to compensate for the tool length variation.

One machining cycle uses four tools per lathe; and since each lathe has a head with eight tool positions, it also has four spare tools, allowing it to be autonomous for ten hours. Two pallets of 100 rings can be completed during this time, after which the operators change the carbide-tipped tools.

Should a tool break during machining, a current loop located on the spindle detects an excessive effort; this signal stops the operation.

Christian Leduc was won over at EMO 81 in Hanover, by tool head magazines which change tools during idle time. But he sees no need to introduce them in his shop. First, because his older H. Ernault Somua lathes would accept them poorly, and secondly, because the 20 minutes needed for the manual operation are not significant compared to the ten hours of uninterrupted machining.

Parts loading and unloading, on the other hand, occurs during idle time thanks to four pallets (two for the rough parts, and two for the finished ones). The rough parts are accurately positioned by retractable fingers; the arm has no difficulty in finding and grabbing them.

With its cooling devices, its seven work stations, and the palletization for 400 parts, the robot covers 50 square-meters. This compactness and the perfect synergy of the whole are the pride of Christian Leduc. "By itself, the robot is only an articulated mechanical arm, a machine-tool like any other," he comments. "We had to surround it with heterogeneous elements." Among these, the two H. Ernault Somua lathes, each worth about 550,000 francs, predated the formation of the cell. The control machine was bought abroad. Including the 520,000 francs for the arm, the total cost of the cell amounts to nearly two million francs without the initial adjustments.

A Cincinnati engineer, for whom this was a test installation but who was no less enthusiastic for it, collaborated in the connection of the test stations to the central computer. For the rest, Christian Leduc and his colleagues worked almost alone.

"Thanks to the experience that I gained, I will need only two weeks instead of eight months to install the next cell," he assures us. "It's not much more complicated than any other installation, as long as you have a rather good knowledge of electronics and computers, and especially, as long as you solve the many problems of mechanical implementation and adaptation. The turn-key robot does not exist." For instance, in this installation a part is clamped on a lathe by means of an auxiliary ram whose thrust is controlled by the computer. In another location, a hydraulic platform for part placement is adapted to the milling machine. The interface between the central computer and the various cables were installed by the electronics specialist of Sahl Leduc.

In addition to the palletization station, the greatest difficulties were probably created by batch changes. Christian Leduc designed adaptable clamps such that the arm's memory remembers the position of parts on the pallet independently of their shapes and dimensions. This minimizes adjustments and reprogramming, and encourages the use of the cell for repetitive intermediate size runs. Despite this precaution, the transition from one product to another still requires nearly three hours for two workers, and the manufacturer avoids making more than one change per week.

To start, the user first programs the motion on a learning mockup. A maximum of 1200 points are recorded in a file in the central computer which guides the robot. Point corrections are subsequently performed by introducing numerical coordinates. The displacement speed between two stations can be programmed at will from 0-1.2 meters per second. Each machining program is then memorized in the lathes' NC computer, which communicates with the central computer; the latter determines the start of programs, as well as controls specific automatic operations, such as blowing or palletization. In case of local breakdown, as for instance the opening of doors on a lathe, the central computer receives the information from the NC computer and stops the operation. Should the handler itself become defective, the manufacturer has the option of disconnecting the lathes and operating them with attendants. But this has not yet happened.

Christian Leduc's experience encourages him to make further investments. An SMT-Pullmax lathe with automatic loading integrated in the machine has been operating since January 1982. Like the robotized cell, it works alone, but on parts that do not have to change orientation, such as hydraulic ram rods. In September, the company will acquire an FLS lathe from H. Ernault Somua, with an auxiliary milling station, tool-head magazines, part sensing, and total flexibility. And finally, the second robotized cell for machining the rear portion of hydraulic jacks is planned for 1983. Its location is already reserved near the first. One supervisor will attend both. Three workers are preparing for this task. They have to be good adjusters, have some knowledge of computers and electronics, and demonstrate initiative. This is the price to pay for moving from a simple NC lathe to the supervision of a flexible shop. It is surprising that several young workers who have been asked to take the step are hesitating. And yet that is where their future lies.

11,023
CSO: 3102/241

RESEARCH ON HIGH PERFORMANCE CERAMIC MATERIALS

Duesseldorf VDI NACHRICHTEN in German 2 Apr 82 p 13

[Article:"Ceramics as Design Materials"]

[Text] Recently a materials colloquium with the theme "Ceramics as a Design Material" was held in Cologne-Porz. The papers and a poster exhibit focused on the material silicon nitride. The work of the Institute for Materials Research in the area of development and characterization of Si_3N_4 and the development of characterization methods for high-temperature-resistant ceramic materials was reported.

Within the scope of research focused on energy and propulsion technology, the German Research and Testing Agency for Aeronautics and Astronautics (DFVLR) has been involved with the development of ceramic materials for high stresses and temperatures since 1975. The objective of this work is to advance the development of alternative, more economical vehicle propulsion systems from which energy savings can be expected from the higher efficiency resulting from higher working temperatures. Working temperatures greater than 1,000°C are, however, only to be achieved by using ceramic materials.

Based on a combination of favorable properties such as low density, low thermal expansion, good oxidation and corrosion resistance and constant strength up to temperatures beyond 1,200°C, silicon nitride (Si_3N_4), alongside silicon carbide (SiC), is considered to be the most promising material for withstanding high stresses. Thus, these materials are of interest for applications other than vehicle power plants alone. Standing in the foreground as an ambitious objective supported by the Federal Ministry for Research and Technology (BMFT) is the development of an automotive gas turbine based on ceramic components. The work of the Institute for Materials Research is focused on this goal. In addition to material development and properties optimization, activities are concentrated on the determination of properties and their correlation with material structure plus the development of new characterization methods.

Molded parts made of silicon nitride can be produced by various methods which fundamentally affect the material properties. Two classical methods for producing molded Si_3N_4 parts are reaction sintering (RBSN) and hot press forming (HPSN). In reaction sintering, a mold filled with silicon powder is heated to temperatures between 1,200 and 1,420°C in an atmosphere consisting primarily

of nitrogen. The resulting reaction converts the silicon into silicon nitride. The big advantage of this method is that the external dimensions of the molded part do not change. In this manner parts with complex shapes can be formed without difficulty. A disadvantage is the relatively low strength of RBSN parts due to residual porosity resulting from the process. However, the room temperature strength is retained almost up to 1,400°C.

Since due to the predominantly covalent character of the Si_3N_4 bond powder parts cannot be consolidated by sintering alone, the hot press method was for a long time the only method by which almost fully dense, high strength Si_3N_4 parts could be achieved. This method requires, however, the addition of suitable agents which foster the compacting process at high temperatures by the formation of a molten phase. These additives, which in general are retained in the material in the form of an amorphous particle boundary phase, cause a loss of strength due to softening at temperatures above 1,000°C. An additional serious disadvantage of the hot press method is that the actual parts have to be ground or machined from the simple geometric shapes--disks, plates--which are the only shapes producible by HPSN.

This disadvantage should be eliminated by the process of sintering and hot isostatic pressing which has been under development for several years since by this method powder parts with complex shapes can be consolidated with due allowance for the resulting shrinkage. Direct sintering (SSN) was made possible by further development of the Si_3N_4 starting powder. In this process, the properties of the sintered part exhibit a specific dependence on the Si_3N_4 starting powder and on the type and quantity of the sintering agent. The effect of these factors and various process parameters on sintering density, structural development, bending strength and fracture resistance were presented. Representative of the state of the art is an SSN part which, with the addition of a mixture of Y_2O_3 and A_2O_3, can be sintered to 96 percent of full density without pressure and which exhibits a room temperature strength of about 600 N mm^{-2}.

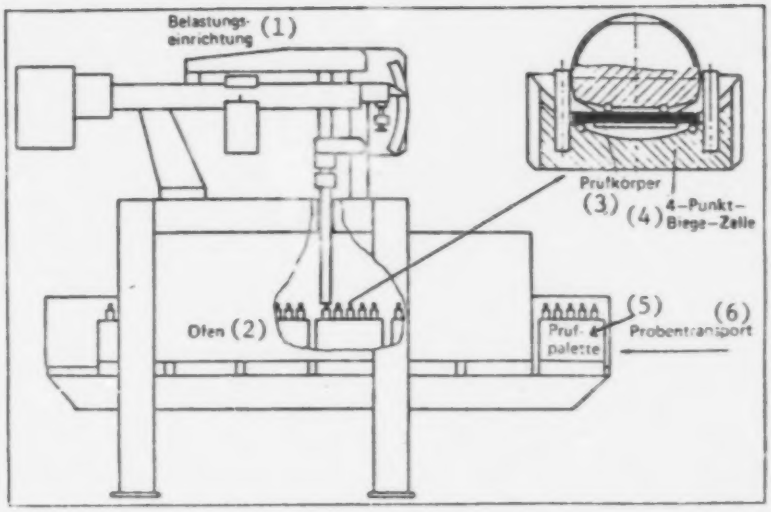
Recently the postsintering (SRBSN) of RBSN has been pursued as an alternative sintering method for producing dense, high-strength Si_3N_4 and for improving the properties of RBSN. Economic advantages were expected from this process. The increase in the number of process steps implies, however, an increase in the influence factors which must be researched.

Hot isostatic pressing (HIPSN) represents a method for producing complex molded parts with HPSN quality which practically eliminates the expensive postworking operation. Progress in HIPing Si_3N_4 was reported with detailed discussion of the problems associated with gas-tight encapsulation, or canning, of porous preforms. Either metal or glass cans can be used. Advantages for universal application are expected from glass cans. This has been demonstrated for simple molded parts, but further development work is necessary for complex shapes. The material quality achieved already surpasses HPSN qualities with regard to isotropy. Tests of canless post HIPing of SSN parts have just started.

In addition to the technology, the papers and posters treated as an additional center of interest the determination of use-related material properties. Since

Process	Reaction Sintering	Hot Pressing	Sintering	Post Sintering	Hot Isostatic Pressing
Short Designation	RBSN	HPSN	SSN	SRBSN	HIPSN
Starting Material	Silicon powder	Silicon nitride powder + additiven	Silicon nitride powder + additives	silicon powder + additives	silicon nitride powder preforms + additives
Process steps	shaping → nitriding < 1420 Deg C ⩾72 h → end product	shaping → hot pressing ⩾1750 deg C ⩾1 h ~30 N mm^{-2} → fabrication from molded billet	shaping → sintering ⩾1750 deg C ⩾1 h (HIP) → end product	shaping → nitriding < 1420 deg C ⩾72 h (HIP) → sintering ⩾1750 deg C ⩾1 h → end product	→ RBSN preforms + additives → SSN preforms with porosity ⩾5 % → canning → hot isostatic pressing ⩾1750 deg C, ⩾1 h 2000 bar gas pressure → end product; SSN preforms with porosity < 5 % → hot isostatic pressing
Process characteristics:					
Shrinkage %	none	./	< 15	< 5	variable
Postworking	none	very expensive	little to none	little to none	little to none
Residual porosity %:	>20	very low	low	low	very low
Bending strength N mm^{-2}	~300 (RT-1400 deg C)	>700 (RT-1000 deg C)	>600 (RT-1000 deg C)	>450 (RT-1000 deg C)	700 (RT-1000 degC)

The tabular summary of the processes for producing molded silicon nitride parts permits a comparison of achievable properties and process characteristics.



The hot bending test machine for continuous operation can be operated in air up to 1,600°C.

Key:

(1)	Loading machine	(4)	Four-point bending cell
(2)	Oven	(5)	Test-sample tray
(3)	Test sample	(6)	Tray conveyor

the loading intensity is not comparable to that of conventional ceramic materials, the test equipment had to be largely designed and built for the new materials. Examples of this are the hot bending test machines for continuous operation as well as the tensile- and creep-test machines. These machines can operate in air up to 1,600°C. RBSN has proven to be well suited as a material for the specimen grip head.

The behavior of the materials in continuous operation is also of interest. This information is acquired through thermal shock and thermal fatigue testing. The room-temperature strength curve determined by the thermal-stress amplitude--room temperature to 1,260°C--versus the number of cycles to failure shows the great importance of this test method for practical applications. Microstructural and microanalytical research methods such as Auger and photoelectronic spectroscopy should illuminate the processes which lead to this material behavior so that they can be controlled during material development. Also, a method for predicting the life of ceramic materials by dynamic 4-point bending tests was presented. This process will be further developed for predicting the failure probability of HPSN at high temperatures.

This overview of the production and test technology for ceramic design materials reveals the necessity for further research work. The large number of participants from the most varied branches of industry reflects, on the other hand, the broad interest in highly stressed ceramic materials and components for purposes such as the development of energy saving automotive power plants.

9160
CSO: 3102/267

HOFFMANN SEES FUTURE FOR WOOD-COMPOSITE PROPELLERS

Celsenkirchen AEROKURIER in German Apr 82 pp 402-406

[Article entitled: "Hoffmann Propellers: With Know-how and Experience in the Service of Progress. Wood-Composite Propellers Have a Future"]

[Text] It is way at the front of the airplane, yet for the most part it is treated in a very unkind way and frequently is given little attention: the propeller. Yet, in many ways the propeller is of decisive significance for the characteristics of an airplane, from overall flight performance to noise development.

That which in pilot jargon is often somewhat disrespectfully called a "slat," is in reality a very complex thing which involves a great deal of aerodynamic, material-technical, flight-mechanical and vibration-technical know-how before it exercises, to the satisfaction of the technologists and pilots, its propelling service on the airplane in an effective, safe and environmentally positive way. Throughout the world there are now only a few companies which have a name in propeller building. Although after the war in Germany things did not work out so well with the development of its own light aircraft industry, Hoffmann Propeller has managed, in a technological respect, to take a leading position in propeller building today, not last because it made a continuous effort to develop and realize its own ideas for solving problems.

Propellers, only propellers, were in the mind of the founder of the company when in 1955 he laid the foundation with great confidence in the upward development of aviation.

Initially, fixed wooden propellers were built in the "Schwarz" tradition and early on an electric variable-pitch propeller was developed and type tested. But the German aircraft industry did not enjoy brisk development such that a company could have stayed alive solely from manufacturing propellers. Thus, servicing foreign products, which did in fact dominate the postwar market, was also taken on and the stock of spare parts--essential for efficient service--was consistently expanded. Thus, connections with all respected propeller manufacturers go back to this period in the late 1950's. Today there are contractual commitments with these international companies, and the special spare parts stock for propellers and parts is the largest in Europe.

The picture of activity at Hoffmann Propeller has, nevertheless, again developed to an increased degree in the direction of manufacturing again. And in the past few years in Rosenheim it paid off that, with the appearance of new technologies, the people there were also simultaneously learning.

While Hoffmann had always emphasized the natural fibrous material wood as an excellent material for propellers because of its great tearing length and its vibration-damping material properties, today the development of propellers--as could be foreseen--is moving away from the heavy vibration-stressed metal propeller to light composite construction materials.

The larger the diameter of the propeller, the greater also the advantages of present-day construction methods in respect to weight and saving weight, respectively, and also moments of inertia. Thus, it is no longer surprising that the propellers of the new commuter generation, which will be used starting in 1984 with new turboengines roughly between 900 and 1,500 kW, will be built almost exclusively with composite blades.

The development of such propellers, controling the diverse strength problems with new material structures are protracted and cost-intensive undertakings which can be handled only by large companies, and then only for the most part with state support.

The results, propeller blades made of fiber-reinforced plastics with or without supporting metal parts, are likewise expensive, because expensive facilities are required in turn to manufacture them. Their advantages in respect to the conventional metal blade are--according to the people at Hoffmann--on the whole not greater than with the wood-composite blade which is being further developed here.

Why, then, might one ask, is the wood-composite blade not in use worldwide? There are several reasons. The large propeller manufacturers naturally have their own development lines and feel a certain aversion to the material which is unfamiliar to them, which they really do not know how to handle properly and which requires totally different material-specific manufacturing facilities.

The aversion, however, likewise stems from bad experiences with wooden propellers which go back to the 1920's and 1930's.

In the United States development of wooden propellers stopped at this level so that the metal propeller, in spite of the greater weight, was able to set forth unhindered on its victorious march. However, in Germany, and especially at the Schwarz Co in Berlin-Waidmannslust, development was consistently continued in the 1930's: wood is susceptible to the influence of the weather. If it is to be used as a load-bearing material then it must be protected from environmental influences. For example, holes must not be drilled, as for example to attach edge fittings, which rain water can then penetrate. In the case of single blades, which must be attached so that they can rotate in a control hub, special attention must be paid to these components.

For this purpose Schwarz used resin-bonded densified laminated wood which was made from thin layers of veneer; it weighs only about half as much as duralumin, but achieves the latter's tensile strength when greatly stressed. Patents for erosion protection without screws and rivets, protective and reinforcing covering of the wood core and details of application for resin-bonded densified laminated wood were everywhere.

In the United States, of course, such improved wood was never used in propeller construction.

Development took a different course during the war in Europe. The fastest airplanes used wooden propellers which also disproved the alleged inferiority of this material for use in designs of especially high efficiency.

The FW 190, for example, had wooden propellers as did, for example, the Spitfire in England. In general, toward the end of World War II, about 90 percent of German airplanes were equipped with wooden propellers. The reason: on the bombed out airfields a short takeoff was important. For thrust augmentation wider blades were needed. These could no longer be made of metal because weights and control forces would have become too great.

The development of the wood-composite propeller, which goes back some time, underwent carefully controlled further development at Hoffmann's in Rosenheim. This is not a chance happening because the advanced technical school for wood and plastics technology is located there and was the training site of several staff workers of the technical staff and the firm's management. The relationship is still close today, and strict controlled development tasks are implemented with consultation and support of the advanced technical school.

At Hoffmann's there is the view that this purposeful adhering to a construction method which is recognized as valid is paying off today. While years ago propeller overhauling was a basic branch of business, today the company's income comes from many spheres of activity, all however characterized by appropriate engineering knowledge, but in part also outside aviation. Thus, the production program at Hoffmann today is very diverse:

--Fixed and adjustable propellers are built, involving--as needed--the most recent findings in respect to noise reduction.

--Thanks to the increasing activity by airplane manufacturers in the FRG and in several other countries variable-pitch propellers for motor-powered gliders are gaining increasing importance.

--Automobiles are tested aerodynamically in wind tunnels; the fan blades were produced by Hoffmann using the tested wood-composite construction method. Similar installations are in use--to mention but a few--at Ford in Cologne, British Leyland in England and Pininfarina in Italy. The experiences thus gained again constitute a safety potential which relates back to airplane propellers, for in the climate-controlled test sections, for example, the temperature is changed in a short time from about -40°C to +50°C. Such fan blades have been in use for many times 10,000 hours.

--Frost control blowers for fruit orchards use blades made with the Hoffmann composite construction method because these devices remain out in the open for 10, 15 years without service. Here experience from aviation technology again has a positive impact on devices located in the soil.

--In the same area we find impeller blades for wind energy plants. Many producers of such plants underestimate the problems of producing such blades. Special success was achieved in this area, for example, in cooperatin with the Siemens Co in Munich and Vienna on two different projects.

--The best proof, however, of the confidence in the wood-composite construction method was offered by the selection of Hoffmann propellers by respected hovercraft manufacturers.

Practically everything that is whirled up from the ground by the rotor or flies around in the air ends up in the plane of propeller rotation of such craft: sand, stones, pieces of ice, to say nothing of the torrents of water which additionally are especially corrosive when sea water is involved.

Such reversible 4-blade propellers, 3 meters in diameter, are being delivered for the Waertsilae Co in Finland. British Hovercraft, the world's leading company, is using a covered 4-blade propeller in its newest designs (88 seats). Recently a new foreign manufacturer joined in, for whom 5-blade, reversible propellers, 4 meters in diameter, are being manufactured for 1,350 kW driving power. Hoffmann was able to finish the order in only 8 months.

--The construction method of the blades, lacking negative forms, is also especially suitable for special designs. Thus, for example, RFB's Fantrainer has been flying for years with Hoffmann blades, and reversible 5-blade propellers are being delivered for the English non-rigid air ship SK 500.

--But at Hoffmann there is also the sector of "pure engineering activity," for example, measuring vibration stresses on propellers in flight for which there is a complete measuring system, or also for analyzing rotors, stators and coverings of covered propellers. For this they have their own Tektronix computer facility which also shows the profiles right away.

--The diversity of the tasks and the income thus produced permitted a restructuring within the company which after many years resulted in noticeable relief for the service sector. Service is supported by a separate pick-up service which is not limited by borders.

--Contracts with all respected propeller manufacturers of General Aviation and Commuter Class constitute the basis of this service work. Beyond that, the TRW-Hartzell Propeller Co will be the representative in respect to European aircraft manufacturers.

Research

Various research and development projects were supported in the past few years, partly from the Bundeswehr sector, the Ministry of Defense and finally from the Ministry for Research and Technology within the framework of the ZKP program.

In a carefully planned joint venture under the direction of the Dornier Co new kinds of propeller blades came into being at Hoffmann whose superior designs were developed in precise detailed work and in wind tunnel experiments together with the DFVLR [German Research and Development Institute for Air and Space Travel] in Goettingen and Braunschweig and the Stuttgart Technical University for a performance class of about 500 kW.

The flight testing of these new blades was done in Hartzell-Naben on the Dornier TNT test carrier. The results exceeded in part the improvements calculated in advance. Thrusts with "artificially eroded" leading edges were also measured in order to establish the efficiency loss with "worn out" blades. The natural change in the propeller leading edges which occurs through erosion during operation has a disruptive influence in the case of many types of designs.

With the new designs the thrust loss in this respect was, however, quite negligible--an additional big advantage of the new technology.

At Hoffmann the limits of the company's capacities are also known. The scope of this last mentioned research activity goes far beyond what a middle-level company can produce on its own with a limited market.

Therefore, it is especially noteworthy that public support and the coordinated cooperation of competent institutions under the direction of the Dornier Co have affected a success which means more than "just" connecting up with the level of knowledge of the Western industrial nations.

12124
CSO: 3102/268

TRANSPORTATION

HOW AIRBUS OVERTOOK BOEING, PROSPECTS FOR STAYING AHEAD

Hamburg DER SPIEGEL in German 31 May 82 pp 61-68

[Text] The competition between the European Airbus industry and the American Boeing concern is getting serious. All their competitors in civilian aircraft construction have now fallen by the wayside. The two companies now hope to corner the market between them which experts estimate will call for 3,600 new aircraft by the year 2000.

At 9:48 am on 3 April 1982, the prototype of the new Airbus A 310 landed safely at Toulouse airport following its first 3-hour test flight. As nervous as ever after a stressful experience, test pilot Bernard Ziegler, a onetime French Air Force ace, climbed out and said drily: "Everything we hoped for on this first A 310 flight has been achieved."

The European Airbus industry wishes to use the A 310, a smaller, technologically advanced version of the 250-seat A 300 with a seating capacity of 210, to make it big on the world market for large carriers and to take its place alongside previously predominant Boeing as its equal and sole competitor.

Airbus president, Bernard Lathière, who makes the other four members of the Airbus top management somewhat unhappy by assuming baroque airs, feels that this goal has already been reached. "We are biggest producers of wide-body aircraft in the world," he says.

The fact is that Airbus—a consortium dominated by the French and the Germans and supported by the Britain and Spain—managed to sell 55 percent of all wide-bodies in the world in 1981. The remainder was divided between Boeing and the two other American firms of McDonnell Douglas and Lockheed.

As recently as 1976, the Europeans managed to sell a mere 33 aircraft despite strong sales efforts and were forced to scale down production from four planes per month to just two per quarter.

Now, nine aircraft are being produced every 2 months which comes to six times as many as then. Starting in 1984, Airbus chief of production Hartmut Mehdorn has plans for producing eight aircraft per month.

The fact is that Airbus has been able to increase its share of the wide-body market year after year between 1976 and 1981.

In 1976, Airbus had no international standing and did not sell a single aircraft. One year later, it had already passed third-place Lockheed which was unable to make headway with its good-quality TriStar L 1011 against the McDonnell Douglas DC-10, which had gone into production somewhat earlier.

When Douglas had to scale down production on its tri-jet DC-10 after a series of accidents, Airbus advanced to second place on the civilian jet market.

And when Boeing, the previously undisputed leader, ran into difficulties as its long-time customer, the American airline industry, began to founder in 1981, Airbus even managed to pass Boeing in wide-body sales.

Starting in 1980, the U.S. airline industry would buy aircraft only if it absolutely had to and was even then opting for the smaller Boeing 727's and 737's. As a consequence, orders and profits of the West coast giant in Seattle went down. Meantime, Airbus was concluding big sales on the European, the African and above all the Asian market and gaining 44 airlines as customers.

In its fight for the market, it was of advantage to Airbus that it had been building the A 300 B, the most modern and most economical wide-bodied aircraft for short and middle distances since 1974.

Boeing will not be able to bring comparative types on the market until 1982 and 1984 respectively: the 210-seat Boeing 767 and the 180-seat Boeing 757. Starting in the spring of 1983, Airbus will counter by beginning delivery of the new 210-seat A 310 and starting in 1986 of the 150-seat A 320, which will have a narrower body.

No other aircraft manufacturer in the world will be able to bring comparable twin-jet aircraft for short and middle distances on the market by that time other than Boeing and Airbus. The two will be by themselves as they compete for a share of the world market which will call for about 3,600 such planes by the year 2000.

Under the circumstances, the sales departments of the two firms are already gearing up for the fight. The Airbus people are fast getting used to the rough style prevailing in the international aircraft business.

The French in particular are quite good at the "hard sell." "No sheik will open his door to you unless he gets a fat bribe," one insider has said. With sales running into the billions, 7-digit bribes are not unusual.

In their dealings with the Indonesian airline Garuda and with Singapore Airlines, Airbus was able to offer better credit terms than the American competition—above all with the help of guarantees by the French government.

In Tunisia, Boeing tried to counter with some tricks of its own. The Americans told Tunis Air—an airline obsessed with prestige considerations—that it would take as yet undelivered Airbuses off its hands at the original price, if the Tunisians would agree to buy four of the newly developed Boeing 767's instead.

The Tunisians thereupon went to Toulouse and asked for a large discount—which Airbus granted them. North Africa from Tunisia to Algeria to Egypt has since turned into still another Airbus market.

An air of panic seized the American aircraft industry which had been in the habit of looking down on the market and on its competitors. Studies were commissioned to find out why the Americans were doing so poorly.

But these studies only created more confusion. Technologically, the studies concluded, the Americans were on a par with the Europeans; the quality of their products was not inferior, and in management, service and sales they were clearly ahead. The reason the Europeans were doing so well was that their governments were supporting the Airbus Industry by extending interest subsidies and direct financial assistance.

But the role the European governments are playing cannot be the whole story. Both the American airplane industry and the U.S. government made one mistake after another with regard to aircraft types and airlines policy.

On the advice of his airlines administrator Alfred E Kahn, former President Carter introduced the "open sky" policy in 1978. Since then, the American airline industry has been engaged in a price war so fierce that there hardly is an airline today which can afford to buy new planes.

That is why oldtime Boeing customers began canceling long-standing orders last year.

United, Eastern and American Airlines called more than 130 orders and options for Boeing 767's and 757's into question, amounting to $5 billion. TWA spent most of its time looking into the used aircraft market.

Following the failure both of Laker Airways and Braniff, that particular market offers first-rate equipment at reduced prices. Already in April 1982, prior to the Braniff debacle, Boeing said there were 38 used Jumbos and 50 used Boeing 727's on the market.

The Boeing management itself shares in the responsibility for Airbus' success. While the Europeans went ahead with the production of twin-jet wide-bodied aircraft, Boeing respected the wishes of the American airline industry for a tri-jet type for some time. It was not until the Airbus had been flying for a good while that Boeing gave the green light for production of two twin-jet types which—to the amazement of the aircraft industry—are not far apart in seating capacity, taking on 210 and 180 passengers respectively.

The Europeans were also surprised about the fact that the body cross sections of the two Boeing planes were designed too small to accomodate the internationally standard-sized freight containers so as to take advantage of an insignificant aerodynamic feature. Any airline flying Boeing passenger jets thus cannot conduct a lucrative freight business on the side which would increase its earnings appreciably.

In cockpit electronics, too, the Americans dropped to second place. The video screen technology developed by the French electronics manufacturer Thomson-Brandt for the new Airbus twin cockpits is more efficient than that of the Americans. There was some resistance against the new technology by the pilots; but it quickly subsided. Starting in 1984, all Airbus planes will be equipped with twin cockpits exclusively.

But things could change rapidly, even very rapidly, if America's airlines would start buying again. Then, the major weaknesses of the Airbus organization—revelling in its current success—would become apparent.

The internal organization of the multinational concern—particularly its resilience with respect to the ups and downs of the market—is not as good as that of the Americans. There also are gaps in the production program. The projected four-jet, long-distance Airbus cannot be built at present for lack of funds. Airbus is only able to offer short and middle-distance jets.

At the Boeing plant in Seattle, jet aircraft of all sizes are being built in four parallel production lines. If the firm is hit with a decline in orders, one production line after another is shut down and the workers are fired. In this manner, Boeing can produce anywhere from 10 to 44 aircraft per month without going into the red.

Airbus is in the midst of the laborious process of setting up its second production line. For the Europeans, declining orders result in slower—which is to say, less economical—production on the existing line and workers cannot be fired from one day to the next.

Production costs of the Airbus are high because of the large and socially secure work force employed there as well as because of the large and costly inventories of semi-finished goods and of the complex transportation network connecting the production facilities located all over Europe. Despite its high $52 million price tag, the plane still costs its producers money.

The French Airbus partner, Aérospatiale, is in a position to absorb losses because the French government helps out; but the privately financed German partner, Messerschmitt-Boelkow-Blohm—which, like Aérospatiale, controls 37.5 percent of the business—is out to make a profit. But profits are not in sight despite the fact that 172 Airbuses have already been delivered, another 200 have been built and 507 more are on order.

But the Europeans are also faced with new costs because of the need for funding the A 320, which is to compete with Boeing on the smaller short and middle-distance aircraft market.

MBB, tired of incurring losses on the civilian market, therefore merely wants to pick up a 20 percent share of the A 320 with France and Great Britain opting for 30 percent. The remainder is being fought over by Italy, Spain, Canada, Belgium and, most recently, the Dutch firm of Fokker.

But this further complicates the organizational structure of the European aircraft industry. The A 300 and the A 310 are being built by fewer partners than the A 320.

Nor has agreement been reached on the engines for the new jet. For this reason, it is to be a joint undertaking involving Rolls-Royce of Great Britain, Pratt & Whitney of the United States, Motoren- und Turbinen Union of Germany and a Japanese group of firms.

Under the circumstances, the A 320 will not come on the market until 1986 at the earliest. By then, the Americans may well have beaten the Europeans to the punch on the hotly contested foreign markets, however, with their already available aircraft types or others about to go into production soon.

Observant Airbus managers have suddenly discovered the answer to the question of why the Americans are planning to build two new jet aircraft types of almost equal size despite high R & D costs for both. "They are going to use the 767 to get a share of the larger-volume market and the 757 for a share of the smaller-volume market," Mehdorn says.

Equipped to carry 210 passengers, the basic Boeing 767 model is to compete with the new 210-seat Airbus A 310. But the 767 can be lengthened to accomodate from 250 to 270 passengers and thus compete with the big A 300 B Airbus.

Equipped to carry 180 passengers, the basic Boeing 757 model can be shortened to provide room for only 150 passengers which makes it into a competitor of the two smaller A 310 and A 320 Airbus models. Boeing thusneeds only two models to serve the middle-distance business of the future while Airbus needs three.

Those in the know at Airbus believe only the French would go through with such a new program that involves risks running into the billions come what may.

The chances are good that this will happen. The man who runs Aérospatiale is former general Jacques Mitterand who enjoys a reputation of being particularly obstinate. The man who runs France from the Elysée Palace is his brother, Francois Mitterand, who is just about as much of a chauvinist as his predecessor Charles de Gaulle. Both are intent on securing technological supremacy in Europe for France.

9478
CSO: 3102/308

ADVANCED PASSENGER TRAIN PROJECT ENCOUNTERS DIFFICULTIES

Paris SCIENCES & AVENIR in French Mar 82 pp 24-25

[Text] In principle, the Glasgow to London APT (Advanced Passenger Train) was to have begun service in the fall of 1979. However, trial runs made that spring proved disappointing. The British transport minister took a short ride on this rival to the French TGV (High-Speed Train) in September 1980 and announced that service would begin "before the end of the year." Once again, however, the starting date was pushed back, to be "definitively" set for 11 January 1982. Now, the FINANCIAL TIMES reveals that in high quarters they are thinking of entirely abandoning the venture.

The last trial runs, made in December 1981, were a disaster. The British Railways had decided to make six round trips on the Glasgow-London line with the ATP over a period of 15 days in order to prove its effectiveness before putting it into service on 11 January. The first trip went well. During the second, an automatic switch was activated, preventing the functioning of the "pendulum" system, chief innovation of the high-speed train. In effect, the body of the train must "lean" up to 9 degrees on curves. With this capacity suddenly lost, teacups began to fly. During the third run, the secondary braking system, intended to stop the train once the speed drops to 80 km/hr, quit in its turn: the lines had frozen. On the fourth trip, the train was halted by snow.

Conceived in 1967, put on the books in 1969, the APT has not stopped having problems. First it was the motorman's station which seemed uncomfortable to the unions. Then the planned gas turbine drive had to be replaced by an electric one, after which the pendulum system had to be modified twice. Now it seems that the third version is still not ready. The braking system, dubbed "hydrokinetic", is especially complicated, and has proven delicate.

British Railways, which still has not entirely given up hope, is seriously considering a replacement: a slower, more conventional train. This would avoid having to solve another problem: for weak stomachs, the pendulum system turns out to be just as terrible as a rough Channel crossing.

9939
CSO: 3102/224

BRIEFS

DORNIER DO 228 CRASHES--Near Igenhausen in Land district Aichach, Upper Bavaria, on 26 March 1982 a multipurpose and feeder airplane of the Dornier 228-100 type crashed during a test flight. The three crew members on board were killed; they were Dornier test pilot Dieter Beckmann (43) and two officials of the British aviation authority, the CAA--Civil Aviation Authority. The flight, which took off from the factory's airfield at Oberpfaffenhofen at 1727 hours, was being carried out as part of the program for British type approval. Since its first flight on 28 March 1981 the prototype, which was equipped with two turboprop engines, had completed 180 flights and 210 hours in the air. Type approval by the German national aviation office for this 15-passenger commuter aircraft was issued at the end of 1981. The further circumstances and the cause of the accident are currently under investigation by the responsible authorities. According to an initial statement by the responsible authorities there is no intention of withdrawing the type approval nor of restricting the current scope of approval since according to what can be said at the moment the accident does not appear to have a technical cause. Almost the entire course of the accident was telemetrically recorded. The accident took place in the course of a flight phase in which, among other things, the job was to simulate a failure of the trim. In order to guarantee the continuation of the approval flights, the Norwegian airline AS Norving has indicated its readiness to make its just recently received Do 228 available to Dornier for upcoming approval flights by foreign authorities. [Text] [Gelsenkirchen AEROKURIER in German Apr 82 p 384] 12124

VW INDUSTRIAL ROBOTS--There has been a steady increase in the use of industrial robots in the past few years in the Volkswagen conglomerate. At present about 570 such automatic operating devices are in use in the various VW factories, with approximately half of them at the main factory in Wolfsburg. The intention is to increase the number of robots at VW to about 800 this year; at present the main thrust of this is the installation of such automatic devices at Audi/NSU in the Ingolstadt and Neckarsulm factories. Welding and handling operations are the focal point. The costs of such an automatic device, according to information from experts, ranges between DM120,000 to over DM200,000, depending on efficiency and design. VW developed the robots, which are in use, for the special requirements of its own manufacturing and will itself in the future also build the equipment necessary for these needs. The capacities for robot production are designed for about 12 devices per week. In this sector VW involves between 130 and 150 staff workers in planning, design and manufacture. [Text] [Essen ELEKTRO-ANZEIGER in German No 6, Mar 82 p 8] 12124

END

CSO: 3102/268

JPRS 81145

28 June 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 108

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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JPRS 81145

28 June 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

No. 108

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MICROELECTRONICS PLAN: WIN MARKET, TECHNOLOGY INDEPENDENCE

Paris L'USINE NOUVELLE in French 18 Mar 82 p 55

[Article by Daniel Lacotte: "The Two Gambles of the Second Components Plan"]

[Text] The administration has just announced important measures to promote the French integrated circuits industry. Without changing the structure of the Components Plan launched in 1978, the government has announced the basic outlines of the action which it intends to take between now and 1986: on the one hand, winning back the French market; on the other, attaining true independence with respect to integrated circuit design.

On the first point, the government has not yet reached a decision as to the aid to be granted to manufacturers in order for their production to cover the French market in 1986. On the second point, the minister of industry estimates that Fr 3.4 billion will have to be invested in research and development over a 5-year period. A budget of Fr 480 million is planned for 1982 as of this writing. In any event, the administration has set the rules of the game: one-third of the investments is to be made by the manufacturers.

Two Centers for Classic Circuits, Three for MOS

The French components industry will thus retain the industrial structure established by the 1978-1982 Five-Year Plan, namely: two centers for classic circuits--Radiotechnique-Compelec (a Phillips affiliate) for bipolar circuits and Thomson for linear circuits, but principally three centers for MOS [mercury-oxide semiconductor] circuits, which represent 50 percent of the world market.

With respect to MOS circuits (strategic components for the future), the authorities decided in 1978 to build French production on American technology. Thus, Matra is associated with Harris, and Saint-Gobain with National Semiconductor (in a common affiliate, Eurotechnique). Finally, the third MOS center is EFCIS, whose stockholders are Thomson and the AEC. Each firm has a plant (Nantes for Matra-Harris; Rousset, near Marseille, for Eurotechnique; and Grenoble for EFCIS) that started production at the beginning of last year.

La Dieli, the official entrusted with the electronics and computer industries in the Ministry of Industry, confirms that "the alliances with our American partners will be maintained," and she estimates that present production capacities

and plans for developing the three plants between now and 1986 will represent Fr 2.3 billion in turnover in 5 years. At this time, the French integrated circuits market is estimated at Fr 4.5 billion. The conclusion of the Ministry of Industry: In order to win over this French market, the three other plants must produce more in order to make up the difference--i.e., Fr 2.2 billion. Now it is known that in electronics, "in order to get one franc of turnover, one franc has to be invested."

Consequently, in order for French production in 1986 to be able to cover the domestic market, the manufactueres are going to have to invest an additional Fr 2.2 billion--a large sum for which the administration and the manufacturers, which have just passed into the public sector, will both assume responsibility. For the immediate future, nothing has yet been determined as to the distribution of aid to the three groups.

Stemming the American and Japanese Monopoly

There is still the problem of research. In the 1978-1982 plan, public credits were increased to Fr 600 million. This was not enough to attain adequate production volume and at the same time launch constructive research in future technologies. The government is contributing part of the answer, since it will encourage manufacturers to invest one-third of the Fr 3.4 billion necessary for France to have true technological independence in 1986. And the state would thus be ready to pay the remaining two-thirds. "It's a big bill, but independence comes at such a price," La Dieli is told, "that it is ardently hoped Matra-Harris, Thomson (EFCIS) and Eurotechnique (Saint-Gobain) will play ball."

Up to now, over the 1978-1982 period Matra-Harris has invested Fr 200 million, Eurotechnique Fr 420 million, and EFCIS Fr 670 million (including Fr 223 million of public aid), for a total of Fr 1.3 billion. The three groups will have to work in double quicktime in the coming 5 years. And this is precisely the gamble of this second Components Plan: Will each of the three partners have the necessary industrial determination to stem the American and Japanese monopoly in the sector?

An Intermediate Solution for Eurotechnique

The launching of this second plan brings up again the problem of Eurotechnique. Will it try to merge the Saint-Gobain affiliate and EFCIS? At the Ministry of Research and Technology, this eventuality is considered a "folly." It is felt that the three centers originally established should instead be retained. But there are two ways of retraining them. For Eurotechnique, it is a question of knowing whether it will remain within Saint-Gobain's domain or if it will be detached from it. The administration is moving toward a median solution: Eurotechnique would continue to belong to the Saint-Gobain group but would no longer be controlled by it. The group's reaction: "It is out of the question; we want to control all the operations or none at all!"

At the start of this new Components Plan, it is no exaggeration to state that the 1978-1982 plan made it possible for the three French plants to prove mass production was possible, even if the 1981 results remain modest (production capacity was Fr 1.1-1.5 billion, while real production did not exceed Fr 500 million). Success will be conditioned by rigorous planning of public aid and the objectives to be fulfilled for each of the centers. It will also depend on the groups, and on the willingness of the men heading them to take up the bet.

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CSO: 3102/217

ELECTRONICS

COMMENTARY ON NEW MICROELECTRONICS PLAN

Paris LE NOUVEL ECONOMISTE in French 22 Mar 82 pp 66-67

[Article by Anne-Marie Rocco: "Components, Six Billion for Chips"]

[Text] Ambitious at the national level, modest at the international one. If the objectives of the new integrated circuits plan are known, its details and approaches will not be disclosed before July. One thing is certain: between now and 1986, the industrialists will have to invest 6 billion francs.

Industrial plans pass but the problems remain. At least that is the case for microelectronics. In 1978, the government had launched a vast operation designed to create, almost from scratch, a French integrated circuits industry, these being the components used as raw material by the entire electronics sector. The year of transition is 1982: one plan ends, another begins. The French production remains insufficient and the trade deficit for integrated circuits is very high: 600 million francs in 1981. Pierre Dreyfus, minister of industry, has just presented to the Council of Ministers the broad outlines of the new effort to be undertaken. The details and concrete ways and means will not be known before the beginning of July. But two objectives have been set: reduce the number of industrial orientations involved, and multiply by nine the value of French production between now and 1986.

The integrated circuits plan of the previous government relied on no less than five industrial groups, to the despair of some of the participants, who would have preferred a more restricted competition. Among them were three already existing enterprises: Efcis, subsidiary of Thomson-CSF and CEA; the Integrated Circuits Division (DCI) of Thomson-CSF; and Radiotechnique Compelec (RTC), subsidiary of the Dutch group Philips. Two other forces were created from the ground up: Matra-Harris Semiconductors (MHS), and Eurotechnique, steered by Saint-Gobain. Except for RTC, all these groupings relied on collaboration with American enterprises which had the necessary technology: license agreements with Motorola for Efcis and DCI, Harris participation in MHS's capital, and National Semiconductors investment in Eurotechnique's capital.

Overall, 1.2 billion francs were spent to create these nodes and strengthen existing structures, 700 million of which came from government loans and subsidies. Compared to the admission price to the electronics scene, the results obtained in 1981 remain modest. Eliminating, from the turnover of the five enterprises concerned, the part

which is pure trading, French production barely amounts to 500 million francs in a world market of 70 billion. It is true that the two new enterprises have only recently begun their activities; production at Eurotechnique for instance, did not start until last summer. The industrial capability of the five groups should in fact be 2-3 times higher than the 1981 production.

Balance

It will however, be necessary to take longer strides. "Considering the future investments that have already been approved and programmed until 1984, French production should normally reach 2.2 billion francs in 1986," explains Jean-Claude Hirel, director for the electronics industry and computers at the Ministry of Industry. Given the evaluation of the future needs of the user industries--from the telephone to data processing, going through toys, household appliances, and automobiles--this production would be inadequate to regain the equilibrium of the balance of trade. The government therefore decided to raise the hurdle and set the production volume desired for 1986 at 4.4 billion.

Ambitious on a French scale, and modest at an international level, this objective implies in any case a considerable increase in financial effort. "Because," the explanation goes, "in this industry it is today necessary to invest one franc in order to obtain an additional franc in turnover." Logically, this means that between now and 1986 the industrialists will have to invest another 2.2 billion francs in order to increase their production capability. But the Ministry of Industry estimates that they will also have to devote 3.4 billion francs to research and development during the same period. Which means a total of nearly 6 billion francs in five years.

For 1982, the government's participation in this plan will be 480 million francs for research and development, and the public agencies will be able to release up to 340 million francs in discounted loans to finance industrial investment. But the overall coverage of the plan has not yet been set, nor have the beneficiaries been designated. And for good reason.

Agreements

No one yet knows the industrial structures on which the plan will rest. The administration's major concern is apparently to reduce the number of production nodes. It is true that in a depressed international market, and given the current cost of investments in this industry, technologic and industrial alliances between competitors are multiplying, in Japan as well as in the United States. Why should the French enterprises, already handicapped by a tight national market and a late start, insist on dispersing themselves? The argument has some logic. A first step in this direction will soon be taken. Efcis and DCI, who already are using a common sales network and a joint administration under the leadership of Paul Mirat, will come progressively closer, aiming at a merger. Their case is a simple one to solve, since they depend on the same industrial group, Thomson-CSF, and since their association with the American company Motorola is limited to licence agreements.

For MHS and Eurotechnique, in which American groups hold nearly one-half of the capital, and for RTC, a multinational subsidiary, the problem will be more complex. Will it be possible to reduce to less than four the number of industrial nodes covered by the integrated circuits plan? The government appears to wish it, while at the same time stating that it will allow the continuation of existing associations; and that it will in no way seek to reduce the participation of foreign partners in French enterprises. How will it square the circle? The answer will be known at the beginning of the summer.

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CSO: 3102/218

ELECTRONICS

INTEGRATED CIRCUITS PLAN EXPANDED TO ALL MICROELECTRONICS

Plan Outlined

Paris ELECTRONIQUE ACTUALITES in French 12 Mar 82 pp 1, 11

[Article by J. P. Della Mussia]

[Text] According to a communique of the Council of Ministers session of last Thursday, the government is going to officially continue its aid to the French integrated circuits industry, and is even going to extend it to the field of microelectronics as a whole, that is, not only silicon integrated circuits, but also machines that manufacture them, materials, GaAs circuits, bubble memories, low temperature circuits, and "custom development."

The financial backing for this microelectronics plan, for the year 1982 alone, amounts to 480 MF for research and development, and 340 MF for investment. Another financial package is under study for the 1983-1986 period.

The government emphasizes that this financial support will be complemented by "an optimization of industrial structures made possible by extension of the public sector," but no details are given about this optimization, for the simple reason that the ministry of industry is still at the stage of theories, and that the new heads of the nationalized enterprises are not yet possessed of all the pertinent data to adopt changes which could prove to be important.

More Than 6000 MF to Be Invested Over Five Years

In this connection, the communique specifies that the Interministerial Group for Integrated Circuits (GICI, responsible for the inception of the first integrated circuits plan, as well as the new microelectronics plan) "will submit, before 1 July of this year, its proposals for the goals and requirements of each concerned enterprise, the eventual structure modifications necessary for optimum utilization of industrial resources, as well as the means to be implemented for training the engineers and technicians who will be needed for the development and implementation of microelectronics."

According to another, non-public document issued by the Ministry of Industry for the use of various interested ministries, attention should also be devoted to formulating a plan that would cover all electronic components in general. The

document also stipulates that "it would be desirable to achieve, within five years if possible, a balance of trade equilibrium for French microelectronics." According to this document, this objective should require on the part of industry and public agencies (which therefore does not mean aid), a total industrial investment effort of more than 2 billion francs between 1982 and 1986--in fact more than 3 billion overall, when the actions already planned for that period are included--and a total research and development effort of 3 billion francs as well.

The government contribution toward the achievement of this objective is not yet defined. In particular, it could partially come in the form of capital increases for nationalized companies. Given the current structure of the French microelectronic industry, one can in any case expect that 80 percent of the announced sums would come either from the government, or from nationalized companies, with the remaining 20 percent coming from the private sector. As a guideline, according to official ministry studies (which we believe are exaggerated), two-thirds of the country's research and development effort before the nationalizations was supported by the government (DIELI and DGRST provide up to 50 percent of support for studies, and telecommunications and the army pay 100 percent of some others); as for industrial investments, the government support was of the order of 40 percent before the nationalizations.

Whatever the case may be, the microelectronic plan for the 1983-1986 period should be finalized by 1 July of this year. The needs will be defined by GICI, but the sources of financing and final decisions will remain under the responsibility of the Prime-Minister.

Redoubled Effort

The 480 MF + 340 MF announced for 1982 appear very large at first sight, when compared to the government financing of the first integrated circuit plan for 1978-1981, which--in 1982 value and with additions made during the plan--finally amounted to 1200 MF (an average of 240 MF per year). But the first plan was aimed solely at integrated circuits and not microelectronics in general. Actually, the ministries of industry (DIELI), research (ex-DGRST), armed forces (mainly DRET), and telecommunications (DA II), have always supported microelectronics activities other than integrated circuits, but without the existence of an official joint action and budget as part of a plan, as in the present case. However, comparisons can still be made for integrated circuits alone: for 1982, the government has planned a financing of 240 MF for research and development in this field, and 300 MF for industrial investments. The announced amounts do not include the financing undertaken in June 1981 for the MHS/Intel operation, among other things. On the other hand, the 240 MF for research and development include 1982 extensions of the first integrated circuit plan, to wit: 18 MF for Thomson/DCI, 45 MF for EFCIS, 21 MF for RTC/LEP, 5.8 MF for Eurotechnique, and 5.8 MF for MHS (the two latter entries also covering a small amount for investments), or a total or 95 MF (including taxes) to be subtracted from the above-mentioned 240 MF for assessing the new allocated credits.

The overall annual increase in the effort is nevertheless considerable, if one takes into account the investment aid.

The other research and development credits will be assigned to fabrication machines for integrated circuits (55 MF), bubble memories (20 MF in reserve), gallium arsenide microelectronics (70 MF outside of discrete devices), low temperature circuits (20 MF), materials other than silicon and GsAs (15 MF), and custom development (60 MF). The two latter categories will help, through specific actions, industries that are currently ill-prepared for electronics, such as toys and household electronics for instance. In principle, they will benefit small and medium-sized enterprises and industries.

For industrial investments, 30 MF are planned for machines and 10 MF (in reserve) for bubble memories, in addition to the 300 MF for integrated circuits.

Neither the distribution of these credits among companies, nor their objects are disclosed at this time. But it is clear that the 20 MF + 10 MF stipulated for bubble memories are intended for SAGEM, if this company undertakes industrial production in order to become second source for Intel or Motorola. Everything therefore depends on the results of SAGEM's current negotiations.

More Precise Objectives

Beyond the figures already indicated, the objectives of the new actions differ from those of the first integrated circuits plan. It might be remembered that the plan's purpose was essentially to maintain the French systems know-how in France; at the time, the success of custom integrated circuits in particular, had caused a drain of ideas toward the United States, where the specialists on custom integrated circuits could be found. Another goal of the first plan was to implant an integrated circuit industry in France, so that our systems industries would not suffer from shortages during periods of high demand. These objectives have been achieved; the new plan will therefore complete them. In its microelectronic features in general, not only does it tend to bolster the country's independence in several strategic domains--particularly for fabrication machines--but it also would allow France to retake the offensive in the advanced circuit arena throughout the world. In fact, the establishment of a "custom development" classification marks the beginning of a global approach to the problem, which will guide the 1983-1986 plan. It will not come as a surprise to find in the latter such classifications as "marketing" or "implantation of sales networks" for instance. Specific product objectives will also be defined, but so will their total costs, knowing that for a family of products, a company currently needs to cover at least 5 percent of the world market to survive, and 10 percent to live.

More Details Furnished

Paris ELECTRONIQUE ACTUALITES in French 19 Mar 82 p 15

[Article by J. P. Della Mussia]

[Text] Following the announcement of the Microelectronics Plan (see ELECTRONIQUE ACTUALITES, 12 March 1982), DIELI and GICI provided further details on 10 March, during a press conference about its implementation, both for this year and for the 1983-1986 period.

Among the comments made on this occasion, the authors of the plan clearly expressed their opinion about the structure of the French industry: "Five areas are currently being supported; we want to reduce this number. It's up to the enterprises to voice their opinions." About Eurotechnique, they said: "For the time being, Saint-Gobain remains in Eurotechnique's capital; however, the question of Eurotechnique's management remains to be discussed."

In particular, it is envisaged that this management will be turned over neither to Saint-Gobain, nor to Machines Bull, but perhaps to Thomson.

4000 MF Worth of Integrated Circuits in 1986

We will subsequently attempt to summarize the advantages and disadvantages of eventual structural changes. For the moment, we only regret that they have not been specified: "It's up to the users to give us their opinion." After all, microelectronics is not an end in itself. The objective of a microelectronics plan should lead to the achievement of the best possible electronic systems, so that France may be in an exporting position in this area; the plan must therefore be drawn first of all for microeletronics users. It is fifteen times better to bring the country's export/import balance for electronics systems to 100-110 percent thanks to good components (turnover of the electronics branch is about 95,800 MF), than to bring the semiconductor balance to 80-100 percent (semiconductors turnover is about 3000 MF, including companies that are not "supported").

For the same reason, the objective claimed by the government "to reach a balance of trade in microelectronics for the 1983-1986 period," should not be advanced as a priority objective. What is important, in our opinion, is rather to have a microelectronics industry that is sufficiently healthy to respond to the needs of electronics systems industries for innovation and rapid response. If in addition to that (or because of it), our balance of trade must reach equilibrium for microelectronics, that much the better. But that is not obvious on the face of it. At a French-German level on the other hand, and eventually expandable to other European countries, a trade balance equilibrium could be conceived to counterbalance the American and Japanese forces.

Except for this remark, GICI approached the problem of the microelectronics industry in a realistic manner.

In order to lay the foundations of a French microelectronics industry, the first integrated circuits plan had outlined a financial effort on the part of the government, of the same order of magnitude (per inhabitant) as that of the countries most involved in this field. Now that this industry does exist, it should not be a follower, but rather should have its own position on the world scene. The financial reference must therefore change. GICI approached the problem in two ways; in both, the conclusion was the same: the present effort must be doubled.

First approach: a critical threshold exists for the succes of an industry. According to GICI studies, this threshold will be reached only if the turnover of the French microelectronics industry reaches 4000 MF in 1986, which is double the amount forecast at the time of the first integrated circuit plan.

Second approach: the French systems market should absorb the turnover equivalent of the French microelectronics industry if our balance of trade has reached an equilibrium in microelectronics by 1986. It so happens that our electronics industry will then need 4000 MF worth of integrated circuits. (GICI does not seem to take into account the turnover of non-supported companies, which will not remain inactive, such as TI or Motorola).

It is based on this goal that GICI calculated that between 1982 and 1986 it would be necessary to invest 2200 MF more than anticipated (meaning a total of 3200 MF), and to devote 3400 MF to research and development during the same period (see our previous issue). At the same time, the yearly shortfall of specialized engineers and technicians was estimated to be 400 people.

Will the American companies associated with some French companies accept to reinvest in the joint ventures created in France? GICI's response is that "this will be the subject of negotiations until 1 July, and could lead to structure modifications." Whatever the case, collaborations abroad should be pursued or expanded if they prove to be desirable.

90 MF Over Five Years for Mass Bubble Memories

Many other clarifications were also offered by GICI about the new microelectronics plan. First of all, the 2200 MF of additional investment between 1982 and 1986 will be distributed as follows: 1900 MF for integrated circuits, 170 MF for machines, and 90 MF for bubble memories. (Involvement in a bubble memory activity is desirable because "the game is worth the candle"). The companies supported by the first integrated circuits plan will have produced a turnover of 500 MF during this year. And the 480 MF released for research and development in 1982 come from the following sources: 230 MF from the Ministry of Industry, 90 MF from PTT, 100 MF from the Ministry of Defense, and 60 MF from the Ministry of Research and Technology.

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CSO: 3102/216

ELECTRONICS

UNIVERSITY DEVELOPS COMPUTER-DESIGNED SEMICONDUCTORS

Duesseldorf VDI NACHRICHTEN in German 9 Apr 82 p 1

[Article: "Computer Developed Microprocessors"]

[Text] A program for semiconductor design developed and delivered to the customer by coworkers at Chair I for Information Theory at the University of Dortmund consists of about 50,000 lines written in the computer language Pascal. According to university information sources, this is one of the first computer design systems developed in the FRG at a university for practical application in industry and is among the very few such developments worldwide.

Highly integrated semiconductor circuits for electrical and electronic devices--chips with up to 60,000 transistors on an area of 0.5 to 1.0 cm^2--present their designers with special problems: Due to their complexity, the circuits cannot be completely represented graphically nor built as experimental prototypes. In the future these designs will proceed faster and easier with the computer design system conceived at Chair I for Information Theory at the University of Dortmund (Prof Dr Bernd Reusch) under the direction of Dr Franz-Josef Ramming. The work was accomplished under contract for Siemens.

The program recently delivered to the customer is part of a larger research project which has been pursued by coworkers of Chair I for 7 years. In this project and follow-on developments, the computer will be used to support design work which is no longer tractable by conventional methods. In this the design will be described in various levels of abstraction with formal mathematical languages, and the desired circuits will be simulated. To achieve this a special design language including syntax and semantics was developed for the computer. A compiler translates these statements and symbols into the internal machine languages of commercial computers, and finally, a simulator makes it possible to execute the functions.

From this development the Dortmund scientists promise a significant reduction in development times for highly integrated circuits. The engineer will describe the chip he wants to build in the expanded mathematical language of the computer. The designs can be defined as a function of the

objectives to be accomplished and prototypes can be built and tested, at least in the computer even if not in reality.

Until now the integration of chips has been relatively expensive due to their time consuming design. With the use of electronic design systems, this time can be shortened significantly, and the cost of chips reduced. Also, it will become possible to produce chips economically for special purposes in smaller lots and to further increase their performance.

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CSO: 3102/291

BRIEFS

SIEMENS FLAT-PANEL DISPLAY--Siemens is presently working on a picture screen which will combine the advantages of the CRT (high resolution, color pictures) and the plasma display (flat construction), according to a Siemens report. The voluminous glass tube is replaced by a flat plasma-filled pan with a front cover of flat glass plate. Flat cold cathodes on the bottom of the pan produce the gas discharge which serves as the electron source. Beyond a plate with anodic lines and control slots adjoins an acceleration space for the emitted electrons whose trajectories measure only 1 mm. The inside of the front plate can be covered with phosphorous points for all colors. The resulting overall thickness is only 6 cm. Presently Siemens has a prototype for data display equipment which can present 28 lines of 80 characters each. The diagonal of the picture display measures 14 inches. [Text] [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 18 May 82 p 5] 9160

CSO: 3102/291

ENERGY

EC PUBLISHES REPORT ON 'PHOTOVOLTAIC POWER FOR EUROPE'

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 26 May 82 p 5

[Text] Frankfurt, 25 May--In the year 2000, European manufacturers of solar cells will produce enough cells yearly to be able to genarate 1,000 Mw of electric energy annually. This corresponds to the output capacity of a medium nuclear power plant. This is the essence of a study by the EC soon to be published under the title "Photovoltaic Power for Europe" on which the THE FINANCIAL TIMES reported briefly on 17 May.

The study's results were presented at the solar energy conference held early in May by the EC in Stresa, Italy. A British corporation consultant company had prepared the study for the Commission. According to these results, by the year 2025 European countries will have installed solar energy power plants with a capacity of 200,000 Mw and they will supply 10 percent of the European electric energy requirements.

The 600 delegates from 30 countries however heard a warning to the effect that these statistics would apply only if the solar cell industry were to continue to get massive support from the governments and public institutions, last but not least, also from the Commission itself. Without this kind of support, solar cell and module production would remain far below the figures given in the study. So far, the government, the public institutions and enterprises have spent $1 billion to promote solar cell research and to develop and test the product. The study demanded that these subsidies be increased considerably in order to improve the pertinent technologies, to cut the costs, and to open up markets for the products.

The EC so far has paid out about $30 million in subsidies and is planning a massive increase in the context of the next 3-year budget. Italy likewise has recognized the enormous potential of renewable energy sources, particularly solar cells. The government in Rome approved a budget allocation of 3 billion lire for the period of 1982-1984 in suppport of the recently formed ENEALIN (National Agency for Alternate Energies). Furthermore, 20 percent of this sum are earmarked for solar cell research. According to the study, Italy has all of the prerequisites for an efficient solar cell industry. It not only has public institutions which readily invest considerable amounts in solar cell technology but it also has a sunny climate plus 70,000 residental dwellings in

underdeveloped areas which are not at all connected to the electric power supply grid at this time. These regions are supplied with electric current only by small diesel generators which supply electric power at costs ranging up to DM1.20 per kwh, converted. That is more expensive than the energy which can be delivered with present-day solar cell systems.

But the costs of the solar cell system are declining gradually. So long as financial support can be maintained at the present level, the study's authors cannot see any reason why the cost could not be reduced to $5 per peak-load watt by 1990 and to $1.6-3.5 per peak-load watt by the end of the century. In view of such cost reductions, the authors conclude that, by 1995, each year about 100,000 solar cell units in the output range around 50 w can be installed for small-scale users throughout Europe. Systems of similar magnitude for navigation aids, for communications, and for cathode corrosion protection would come to an annual installation rate of 50,000 units. The growth of these small systems which are independent of the grid should add up to about 12 Mw per year by 1995.

In the area of larger systems, likewise independent of the grid, in the output range of around 5 kw, to replace smaller diesel generators, about 4,000 units will be installed by 1990 according to the study and from then on, an average of 8,000 units will be installed each year until 1995. Around 1995 accordingly the installation rate will be something like 40 Mw annually. In both sectors however the market penetration in view of the authors will reach its high point at these levels and the installation rates will then level off.

The situation is entirely different in the case of large industrial or solar power plant systems connected to a supply grid. The authors believe that solar energy will penetrate these sectors only from 1995 on. Until the year 2000, grid-dependent systems, with a capacity of up to 25 kw to supply residential areas, will be built at a rate of 800 Mw per year. According to the study, the figure would appear to be 2,000 Mw each year by 2025.

In industry, where systems with an average capacity of 100 kw are being installed, a total capacity of 1,000 Mw from solar cells will be achieved by the end of the century according to these forecasts. Power plants still need considerably greater capacities on the order of 200 Mw. As the projections show, large-scale solar cell systems, with a total capacity of about 50,000 Mw, will have been installed for electric power supply grids by the year 2025. But a major increase in these installations will start only in 2000. If we start with a basic installation rate of 1 Mw, which will be attained in 1983, we can figure on a growth rate of about 50 percent and the annual increase accordingly by the end of the century will be 1,000 Mw. If this development continues unhindered during the first two decades of the 21st century, then Europe will, by 2025, be able to have 200,000 Mw from solar cells and that comes to 10 percent of electric power requirement of the EC.

Because sales of solar cells in the rest of the world are many times greater than in Europe, the study starts with an annual world market sales volume of $5-10 billion around the year 2000. The Commission now wants to do everything to make sure that the European solar cell industry will be able to cope with the anticipated enormous increase. For this purpose it launched a program

last year for the presentation of large-scale projects. Originally, the intention was to provide partial financing for the construction of 19 solar cell generators with a total capacity of 1.3 Mw of which at least one would be built in each member country.

Political, technical, and financing problems forced the Commission to scale these plans back. According to the latest status, 17 generators are now to be built in nine out of the ten member countries. The only country in the EC not considered in the program is Denmark. The first of these 17 generators is to be placed in operation in June on Crete. The other projects will be completed by June 1983. In spite of the start-up difficulties, the Mission is confident that 17 generators will be the forerunners of hundreds of larger plants in the output capacity range from 100 kw on up. The report entitled "Photovoltaic Power for Europe" will soon be published by D. Reidel Publishing, P.O. Box 17, 3300 AA Dordrecht, the Netherlands.

5058
CSO: 3102/307

FRG, AUSTRALIA COAL LIQUEFACTION STUDY: RESULTS

Duesseldorf CHEMISCHE INDUSTRIE in German Apr 82 pp 222-223

[Article by Ernst Koch: "Getting Liquid Fuels Economically from Coal"]

> [Text] Early in 1979, the Federal Ministry of Research and Technology in Bonn and the Australian DNDE (Department for National Development and Energy) in Canberra awarded a study contract to a German consortium under the direction of Imhausen-Chemie GmbH [Incorporated] to investigate Australian coal--from the federal states of New South Wales (NSW), Queensland, and Victoria--to make liquid fuels. This so-called Imhausen Study was delivered to the customers on 31 August 1981, right on schedule. The study was presented in Canberra, Australia, on 16 November 1981. The following attended: Representatives from the Australian federal government, representatives from the German federal government, representatives from the governments of the Australian federal states of New South Wales, Queensland, and Victoria, and representatives of the Australian organizations and German firms responsible for the study (see also "Imhausen Study Delivered to Australia," CHEM. IND., 12, 1981, p 757). In the following we present extracts and summarized results of the economic feasibility calculations which were prepared in each case for the construction and operation of a plant for the liquefaction of hard coal and the procurement of carburetor fuel, diesel fuel, and liquid gas in the Australian federal states of NSW and Queensland as well as for the erection and construction of a plant to produce engine fuels from brown coal in the federal state of Victoria.

The basis for the feasibility study is an optimization study, completed in December 1978, in which 11 combinations of methods for the conversion of coal into engine fuels were compared. This optimization study led to the result that the combination of a Fischer-Tropsch synthesis with the improved IG Farben method of high-pressure hydrogenation is recommended for the production of engine fuels in keeping with specifications on the basis of hard coal and that the improved IG method is the most economical process for the production of engine fuels on a basis of brown coal.

The feasibility study was based on standardized plants with an annual capacity of 3 million t of engine fuels whereby NSW and Queensland were to account for 50 percent, each, carburetor fuel and diesel fuel, while Victoria was to supply 66-2/3 percent carburetor fuel and 33-1/3 diesel fuel. The assignment for NSW and Queensland concerning LPG production called for a maximum of 15 percent in terms of motor fuels while no LPG was to come out of Victoria as a product ready for sale. The hydrogenation tests for the individual coal grades were performed in the Federal Republic with members of the consortium--Imhausen-Chemie GmbH, Lurgi Kohle and Mineraloetechnik GmbH, Ruhrkohle AG [Incorporated], Rheinische Braunkohlenwerke AG, Ruhrchemie AG, Salzgitter Industriebau GmbH, and Uhde GmbH--or by specially designated institutes. The results of these hydrogenation tests constitute the foundation of this study.

Documentation for Technical and Economic Evaluation

All documentation necessary both for the technical and the economic evaluation of the project was developed in close cooperation with the Australian partners. These data include the following:

1. Data on location and site conditions, that is to say, on the topographic location of the planned plants, the environmental conditions, the coal deposits, the location of the future ash dump, the traffic connections, water supply, and the possibility of using waste water.

The plant in NSW was to be built in the Upper Hunter Valley, about 8 km from the city of Scone. The site for the plant planned in Queensland is near the city of Wandoan.

The Latrobe Valley was selected for the Victoria project. In all three cases, the sites were selected in the immediate vicinity of the coal deposit. In designing the processing plants, with reference to the necessary safety mechanisms and the possible effects on the environment (waste water, noise, and immissions), the corresponding requirements and standards of the FRG were used as basis.

2. The resources requirements--such as, for example, electric energy, steam, cooling water, etc.--were recorded for each individual processing plant and the required installations for a complete and energy-autarchic plant (power plant, re-cooling plants, fresh-water treatment unit, tank farm, oxygen plants, workshops, etc.) were also considered during the dessimination of the investment costs.

3. Another group of data relates to personnel planning, specifically, to the personnel requirement during the period of construction and then to the personnel requirements for operations, maintenance, and repair as well as administration. In NSW and Queensland, administration, operations, and maintenance would require 3,155, each, while in Victoria the personnel requirements would be 2,215 in case of pure hydrogenation.

4. The calculations which were made concerning the actual construction activities--preparing the timetable and determining the actual working hours

certain return figures for each object which were once again computed for additional assumptions, for example, regarding the different ways of considering inflation parameters. The model parameters among other things included the following assumptions: Inflation rate in the chemical process industry of the FRG 6 percent per year, in the Australian chemical process industry 8-12 percent per year, personnel cost inflation for Australian manpower 10-14 percent per year, inflation rate for final products 11-15 percent per year, inflation rate of coal prices 5-10 percent per year, depreciations: Linear depreciations.

As part of the sensitivity analyses, the effect of the most varied factors on the earnings and expenditure sides was investigated. The following definitely exert influence here: Product prices and their relative price movements, capacity utilization in the plant as such, construction costs, rates of exchange and costs of coal; the following are less sensitive: Personnel costs, relative equipment price fluctuations, depreciation rate, taxes and customs duties, insurance premiums, community taxes, overhead costs, general expenses, and, finally, financing arrangements.

Macroeconomic Factors

The profitability figures, determined for the plant planned in Victoria--with brown coal as raw material--on the basis of the discounted cash flow rate of return method, show us that this plant will operate profitably under the assumptions concerning the future of development of costs and prices.

In the analogous calculations of the return figures for the locations in NSW, with hard coal as raw material, and Queensland, again with hard coal as raw material, we also obtained good figures. If we include general economic considerations of the individual federal states and the overall interests of the Australian federated state in our considerations, then it would be meaningful to go into further detail on all of these three projects and this indeed is to be expected.

By way of supplementation, the study also points out that, in the case of capital-intensive products, such as coal liquefaction plants, an increase in product prices after the completion of the capital investment can quickly be expressed in an improvement of the earning power. That applies even if cost inflation attains the same order of magnitude as the rise in product prices. If one wishes to wait with the implementation of synthetic fuel projects until the international oil prices have reached such a level that high returns can be achieved already during the first few years, then a negative development might be triggered.

The study concludes with references to the macroeconomic factors which must also be considered in evaluating the economic feasibility calculations. This includes the following:

1. Additional employment possibilities. Beyond the personnel requirements for administration, operations, and maintenance, the influx of secondary enterprises in the area to be serviced could in each case lead to the creation of a total 6,000 new jobs.

required--start with the assumption that the construction of the plants in Australia will be begun on 1 January 1984 and that the construction time will extend over 6 years so that the plants will go into operation in January 1990. The entire personnel requirement for the construction of the plants, expressed in man-months, was estimated at 190,000, each, for NSW and Queensland and 150,000 for Victoria. The personnel requirement for the preparation of the site, for the general organization of the enterprises participating in the erection of the plant, and for transportation as well as services at the construction site is not included in the above figures.

Investment Expenditures

Considering all of these documents and the initial technical figures, the investment expenditures were calculated for each individual production plant, including the auxiliary plants, on the price basis as of the middle of 1980, first of all in DM figures and these were then converted into Australian dollars (A$). These computations also contain the expenses for license and know-how contributions for standard technologies.

The following pure investment expenditures were determined: NSW 3.57 billion A$, Queensland 3.49 billion A$, and Victoria 2.64 billion A$. Individual divisions of the plants among others include the following sums (given in millions A$ in the sequence of NSW, Queensland, and Victoria): preparation and hydration of coal 892, 885, 819; synthesis gas generation and Fischer-Tropsch synthesis 693, 672, --; refinery 325, 318, 278; power plants, 639, 638, 748; secondary installations and additional facilities, 556, 545, 313. If we also figure the maritime and inland transportation costs, the development of land at the site, the capital costs, and the operating costs for the temporary camp for the personnel sent by the construction companies, plus the development costs for the ash dump, customs duties for imported systems components and project management for the construction time as such, we get total costs of 4.13 or 4.02 or 3.11 billion A$.

On the basis of this investment cost determination and with the help of the discounted cash flow rate of return method, an economic analysis of the projects was used as basis in the light of the following assumptions: Each plant is an independent enterprise whose exclusive business activity consists in the operation of the coal liquefaction plant. A construction time of 6 years and an operating time of 20 years are being assumed here; the asset investments relate exclusively to the construction time; the operating capital is to be supplied from the company's in-house funds; tax obligations exist toward the communities, the federal states, and the Australian Commonwealth; the effects of inflation are considered in the context of the average annual rate of inflation and the investments in plant and equipment will be financed by means of long-term loans.

Wholesale prices (excluding the mineral oil tax), based on the data from the Australian Prices Justification Tribunal as of 1 June 1980 were used for the product prices. In place of the unavailable data on typical marketing and sales costs in Australia, a certain assumption was made per liter of product. A comparison of the average flow and the expenditure calculation gives us

2. The construction and operation of coal liquefaction plants promotes a higher educational level among the personnel--an effect which can generally be favorable for the country.

3. The Australian economy's autonomous supply capability is improved along with effects on all sectors of the national economy and dependence on crude oil supplies from abroad will decline.

4. An improvement in the balance of trade is closely connected with this because crude oil--especially in case of rising world market prices--can be replaced by products deriving from domestic coal supplies.

5. The Australian economy will grow in terms of highly-developed technologies which can fertilize not only future technical developments in Australia but which would also lead to a situation where an economy, heavily geared toward the export of valuable raw materials, is replaced by a refining economy based on domestic deposits.

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CSO: 3102/281

MODERN COAL TECHNOLOGY: FLUIDIZED BED COMBUSTION

Duesseldorf HANDELSBLATT in German 2 Jun 82 p 27

[Article by Karlheinz Ludwig: "Modern Coal Technology--Ash-Rich Coal Also Burned Up in Fluidized Bed"]

> [Text] Tighter environmental protection regulations compel far-reaching noxious substance elimination during coal combustion. One effective method here is the burning of coal and low-grade fuel in the circulating fluidized bed. Fluidized bed technology has been used successfully for almost 30 years in chemical industry processes. It is now used to generate process heat and electric energy. Ash-rich and sulfur-rich waste coal washing piles, as well as residues from coal refining processes can be burned in this way just as much as high-grade coal but also oil shale and sulfur-rich oil residues.

ZAWSF ("Circulating Atmospheric Fluidized Bed Furnace") is also suitable for environmentally safe power and thermal power plants with hard coal furnaces. Particularly interesting is the ZAWSF for plants which, for reasons of economy, require a thermodynamic design with high steam parameters--but also with intermediate superheating--and which create high requirements both in terms of the regulation capability and also in terms of the speed of load [charge] change. Here, ZAWSF is distinguished by the following:

Desulfuration in the furnace at very low limestone consumption;

Little nitric oxide formation as a consequence of lower combustion temperature and two-day combustion management;

Plus high carbon burnup due to the longer time the fuels spend in there;

Possibility of using a broad range of fuels, including ballast-rich, low-volatile, and sulfur-rich coal;

Good adjustability of plant also in the partial-load and low-load range with adequate load gradients;

High overall efficiency compared to conventional boilers with flue gas desulfuration system;

Small structural volume, therefore lower investment and operating costs compared to conventional systems with flue gas desulfuration;

Suitability for the construction of larger units of up to, initially, 150 MW_{el} and, in the future, up to 300 MW_{el} in one module.

An example of ZAWSF is a system for environmentally safe coal combustion which is just about to be placed in operation at VAW (United Aluminum Works) at the Luenen plant. The plant generates 83 MW_{th} by means of the combustion of cheap, high-ballast-containing coal. A portion of that heat is used via a salt heat exchanger to heat a high-temperature salt melt as heat source in a process stage of aluminum oxide manufacture. In the past, this salt melt was heated in special oil-fired or gas-fired combustion chambers. The steam likewise needed in the plant--previously generated by burning high-grade nut coal--is then produced at 64 bar and 480°C likewise in the ZAWSF system. The greater economy of this new technology ought to be quite obvious even now.

In using this technology however we go even further today: Plans call for supplying an entire industrial enterprise with all currently available energy types on the basis of a single raw material, that is, coal. Here again, the Luenen plant of the VAW has been mentioned as an example. Clean fuel, such as oil or gas, must be used for the aluminum hydroxide calcination step (likewise in a circulation fluidized bed) which consumes much heat. It is therefore impossible directly to charge coal here.

In order nevertheless to be able to work with coal, the heat is generated with the help of a coal gasification system that works according to the principle of the circulating fluidized bed. Here the coal is only partly gasified by adding hydrogen and oxygen at atmospheric pressure--just as far as necessary in order to cover the share of the combustion gas in the context of the plant's overall energy balance. The still heavily carbon-containing residues are then burned up in the ZAWSF system with a total output of 83 MW_{th} and are converted into process heat or current and steam.

Modern methods make it possible today to produce steel even without blast furnaces. But we work with a reasonable cost structure here due to the direct reduction of iron ore with natural gas or coal into sponge iron. In contrast to the increasingly poor scrap qualities, sponge iron is free of harmful alien metals and is directly melted into steel, with even highly-pure qualities in electric steel plants. Low investment costs, better market adjustment, lower personnel requirements, and environmentally safe operation enhance the significance of direct reduction.

Direct reduction, using natural gas in a continually operating shaft furnace, can be economical only for countries with their own natural gas deposits in view of the high energy prices. Direct reduction on the basis of coal permits the use of low-grade, noncokable coal. As reactors we use here rotary

furnaces, such as they have proved themselves for a long time also in the lime and cement industries. They are insensitive to the size of the raw material grain. This is why cheaper ores and concentrates can also be charged indirectly.

Coal and ore are charged into the revolving pipe simultaneously. During the movement through the reactor, the coal is used up at temperatures of around 1,000° C. The carbon monoxide generated in the process reduces the ore, still in the solid state, to a metallic product, in other words, sponge iron. By blowing air in to burn up the surplus carbon monoxide, we get a controlled temperature. The combustible volatile coal constituents are used to heat up the raw materials in the forward portion of the revolving tubular furnace; the hot waste gases can be used for steam generation. Sponge iron and residual coal are cooled after leaving the rotary furnace and are separated from each other magnetically.

More than ten plants are already using this method, mostly in countries without their own coking coal deposits. In New Zealand, for example, where inferior brown coal and local iron sand concentrates are used as raw material base, steel production independent of imports was made possible only by this method developed by Lurgi.

Low-temperature coal carbonization and coking are among the oldest methods for refining coal. The coal is degasified; by heating the coal, we can expel its volatile constituents. They consist of gas and tar as working materials. The coke is then left in terms of quantity and as the most important product. As a smokeless fuel it used to be quite in demand in households and small enterprises. It is the most important means of reduction for the iron industry.

The coking of caking hard coal in chamber furnaces is a traditional technology. By means of carbonization involving gas recirculation [purging of distilled gas by rising gas] however we can also process noncaking hard coal and brown coal. The latter of course must be predried and, when we are dealing with place brick coal, it must also be briquetted. In the shaft furnace, the coal is finally dried first of all in the upper part. Low-temperature carbonization takes place in the main part at 800° C. The cooling finally takes place in the lower part. This circulating cleansing gas is used for degasification and is partly burned up in case of a shortage of air. In this way, the heat requirement for low-temperature carbonization can be supplied in a simple manner. The low-temperature carbonization gas contains tar, oil, benzene, and water vapor. They are separated during gas cooling by means of condensation. The main products are either coke or tar, dependent upon the market situation.

The Lurgi-Ruhrgas method is used to generate low-temperature carbonization gas and city gas through the degasification of high-grained hard coal or brown coal along with the procurement of fine-grained coke for metallurgical purposes or for steam boiler furnaces. This method is significant also for the future processing of oil shale and tar sand deposits which are found worldwide. The main characteristic of this method is the use of fine-grained heat sources

which are managed in a cycle. Additional characteristics are the simultaneous heating and the pneumatic conveyance of the heat sources so that there is no need for a separate apparatus for heating. After heating, the heat sources are brought into direct contact with the charge material; as heat sources we use sand, coke, and similar products, preferably the reaction residues formed in the course of the process itself.

On a large industrial scale, coal has been gasified for decades to make heating gas, reduction gas, or synthesis gas (for the production of fuels, chemical raw materials, or district gas). Here the coal is converted as completely as possible into gas mixtures (CO, CO_2, H_2 CH_4, etc.). As gasification agent, we use, for example, mixtures of air or oxygen with water vapor or hydrogen. For industrial use, we have three autothermal methods available:

Gasification in the fluidized bed (Winkler method),

Gasification in the flue dust cloud (Koppers-Totzek method),

Gasification in the solid bed (Lurgi method).

The Lurgi process so far is the only method used on a large scale under pressure (20-30 bar). More than 90 percent of the coal gasification capacity available today and planned for the immediate future are based on that. In the Lurgi pressurized gasification method, we use the countercurrent principle. The coal is moved from the top down through the gasifier, whereby it goes through various zones (drying, low-temperature carbonization, gasification, combustion of residual coke). The gasification medium, for example, a mixture of steam and oxygen, and the raw gas flow from the bottom to the top. The coal is moved through a coal lock into the reaction chamber which is pressurized. We use a revolving grate to remove the ash and then the ash is taken out via an ash lock.

Using this reactor principle, we can produce various types of gases, for example, lean gas (industrial heating gas, combustion gas for combined gas-steam turbine power plants), heating gas with city gas quality, synthesis gas for the production of methanol, ammonia, liquid fuels and SNG (district gas). The potential of the reactor principle was definitely broadened in recent years as a result of intensive development efforts.

Pressures of up to 95 bar were attained in the "Ruhr 100" high-pressure gasifier; under these conditions, the methanol content of the gas (and thus also the caloric value) were definitely increased; it was also possible definitely to reduce the specific consumption of coal, oxygen, etc., as well as the yield of liquid hydrocarbons. This leads to a simplification of the subsequently connected system parts.

The so-called British gas-Lurgi slag tapping generator was developed in cooperation with British Gas; here the slag is obtained in liquid form. This is achieved in that--by means of a low steam-oxygen ratio in the gasification agent, amounting to about 1:1--we can adjust temperatures which are above the ash melting point. In contrast to that, the revolving grate generator requires a steam-oxygen ratio of at least 5:1. Here we get the ash in a granular form.

In the variations of solid-bed gasification, we can use practically all types of coal and we can produce gas for various purposes. This has been proved by the more than 160 gasifier units built so far.

Coal is the basis for chemical raw materials which also include tars, oils, gas-benzene, and phenols. Here, coal pressure gasification offers two possibilities for the production of high-grade fuels. One of them leads via the conversion of synthesis gas with low-pressure methanol synthesis to methanol. Here, the coal can be converted into methanol with a thermal efficiency of 50 percent. The efficiency goes up to 62 percent if the system is so designed that we will also get SNG (synthetic natural gas, in other words, CH_4) which we for example can feed into the natural gas network. Methanol is used as a chemical raw material and fuel additive or to operate motors especially designed for methanol operation. We can go one step further and, using the Mobil method, we can produce gasoline from methanol via a catalyst. A reactor system which can be used on a large scale in industry has already been designed for this purpose.

In the second variant we are dealing with the large-scale industrial production of gasoline and diesel fuel from synthesis gas with subsequently connected Fischer-Tropsch synthesis. This technique was used in Germany during the middle of the 1950's until (here likewise) it became uneconomical as a consequence of cheap crude oil. Only the Republic of South Africa continued to show interest in this. That country had large deposits of ash-rich and cheap hard coal available as raw material. The Fischer-Tropsch synthesis method was just about ideal here. Sasol I has been in operation since 1955; Sasol II is a plant which has been in operation since 1981 and is ten times bigger; Sasol III is to be placed in operation by the end of 1982. The idea then is to process 33 million t of hard coal in all three plants annually; that is tantamount to 40 percent of Germany's hard coal output. South Africa then produces 4.5 million t of liquid fuels per year. According to government data, Sasol is supposed to cover more than half of South Africa's fuel needs.

The Fischer-Tropsch synthesis method is a fully developed process for coal liquefaction. After pressure gasification of the coal, the raw synthesis gas is purified in the "Rectisol" method. The synthesis gas--which consists primarily of carbon oxide and hydrogen as well as smaller parts of methane and residual carbonic acid--is converted into hydrocarbons in the Fischer-Tropsch reactor system with an iron catalyst. German companies developed a special cube reactor for this (Lurgi-Ruhrchemie high-performance reactor). The main products from this process are gasoline, diesel fuel, district gas, liquid gas, and ammonia.

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CSO: 3102/319

INDUSTRIAL TECHNOLOGY

FIRST INTELLIGENT ROBOT OPERATIONAL IN RENAULT PLANT

Paris L'USINE NOUVELLE in French 1 Apr 82 p 56

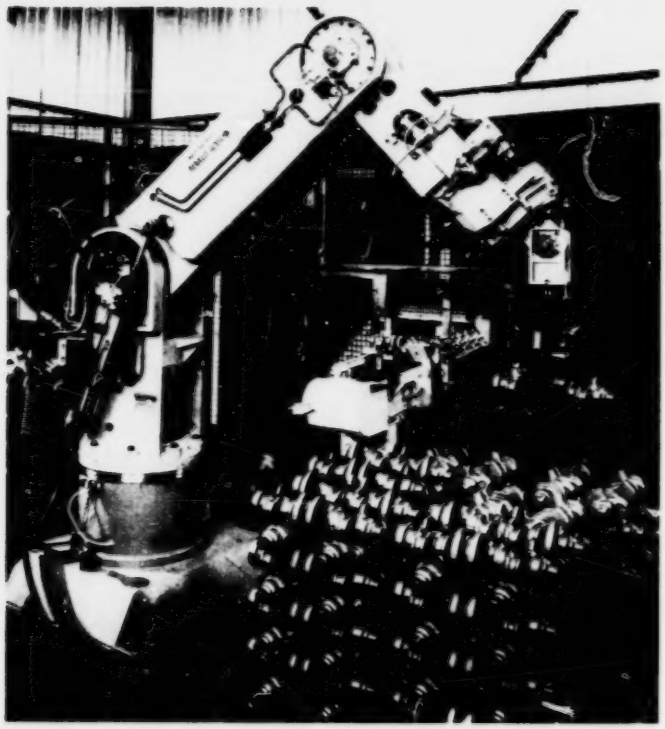
[Article by Michel Defaux]

[Text] The first French shape-recognizing robot is in operation. Located at the Renault Cleon plant, it has made it possible to perfect various components of the system, and opens the way for other applications of artificial intelligence.

The shape-recognizing robot developed by Renault's Division of Advanced Technologies and Automation (DTAA) is now in operation. Installed in August 1981 at Cleon, it was only 50 percent efficient last February; today, its efficiency has grown to nearly 95 percent. This vertical robot grasps crankshafts cross-piled on pallets (108 crankshafts in six layers) and feeds a machining line. Located in front of the loading station of the line, it alternately services two pallets located on its left and right (pallet positioning is plus or minus 5 cm). Two fixed cameras are located above, and sixteen mercury lamps illuminate the parts, since ambient light and especially direct sunlight on the crankshafts had raised many problems at the beginning.

This installation in an industrial environment has made it possible to select and perfect the system's various components (sensors, grip, cameras). For instance, the sonar installed in the grip is the same one mass-produced for Polaroid cameras; it is a simple, inexpensive, and reliable sensor, with a linear response which makes it possible to extract information of the order of a millimeter.

An information phase (90 s) begins with the arrival of a full pallet: the robot measures the six piles with its sonar (scale correction of the camera) to determine which cycle to enter (it always begins with the uppermost because it is easier to grab). It then calculates the center of gravity of each pile from an image, and corrects the initial grasping program. One point on the crank of each shaft is verified to determine the alternation of positions. The actual grasping cycle can then begin: the camera then concerns itself with only one single pile. The information gathered is filtered and memorized; it is then used to calculate the X and Y coordinates, the position of the center of gravity, and the angle of the crankshaft (a deviation of 15 degrees from the axis is tolerated). The grip-to-part



Shape recognizing robot for unloading crankshafts from pallets and loading them on a machining transfer line.

distance is measured by the sonar device. The grip is self-compensated in the finger closing mechanism, and can thus accept an error of 10 mm in position location. The robot grasps the crankshaft, places it in the proper position (large diameter always on the same side), and loads it into a vee on the line (positioning precision of 4 mm).

The recognition cycle (23 s) is repeated for each part, but occurs during idle time (while the robot works). "We developed sufficiently fast algorithms," states Jean Bach, computer engineer at DTAA, "but we had to use many tricks to reach a processing time of 2.5 s."

This achievement is a compulsory milestone for all future applications: assembly, arc welding, deburring, part inspection, grasping from random piles. There is no shortage of projects, and some of the tools are already available.

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CSO: 3102/240

TMI-FOREST USES CAD IN MACHINE TOOL MANUFACTURE

Paris INDUSTRIES & TECHNIQUES in French 10 Mar 82 p 31

[Article by A. P.]

[Text] Half as much design work, and real-time cost control.

Of all the European machine-tool builders, TMI-Forest was the first to adopt computer-aided design (CAD) in September 1980. Since then, computerization has not stopped in the Capdenac plant: terminals have appeared everywhere to measure real-time manufacturing and design.

CAD began with hydraulic components, whose drawings are stored in the computer. These were followed by electrical components, which are ten times more numerous, and whose drawings were difficult to subcontract. "With the computerization of electrical and hydraulic parts, we have halved the load of design offices," declares Pierre Tillemand, head of this sector. "The first consequences have been a displacement of personnel, a reduction in subcontracted studies, and better prototype quality." Today, it is the turn of mechanical components, but the dimensions of the manufactured parts make the application more difficult. The profitability of CAD is highest for a family of applications of the same type: in that case, the parameter categorization of a part model results in an enormous gain. Let us assume a strut: the designer brings the basic drawing on the screen, where the operator answers questions about the values of each desired characteristic. The drawing is changed accordingly, and the computer calculates the optimum values for any given characteristic. If the part model requested by the operator does not exist in memory, it is still possible to draw it directly on the screen by means of joined straight and curved lines.

Several mechanical parts are already being drawn on this system (the CV CADSS3), beginning with 20 families of struts, simple shapes of revolution suitable for training the designers, and a ball screw, a vital part which defines the machine's design time. CAD should cut the time for this part by two to three weeks.

At TMI-Forest, despite the large variety of products (machines for aeronautics, milling machines, planers, borers, and machining centers with capacities higher than 800 mm to the cube), CAD provides great flexibility, eliminates huge files, and

helps solve complex-shape problems. The machine presents drawings in a pleasant and uniform format, translates them into English or German, and adapts them to ISO standards. A plotter makes the drawings during the night, without supervision.

The system reopens the question of the traditional standards and methods. For instance, draftsmen-designers had been working by copy and identification; henceforth they will reason by function.

One feature is retro-indexing: the end of a file indicates the locations of any given component. This avoids searching and listing each type of component.

With two raster screens, the designers do not need to erase what is already on the screen in order to obtain additional information: they merely have to show this information in the background. There is however a problem: the screen definition (500 x 500 lines) is inadequate for operator comfort, and for viewing large-dimension mechanical parts. TMI-Forest expects to move to 1000 x 1000 lines.

Another one of CAD's uses is computation, as when representing in three dimensions the collision risks between a part being milled, such as an alternator rotor for instance, and the platform of the machine's carriage. This type of situation is difficult to draw by hand. To this, Pierre Tillemand adds the calculation of the oil volume needed in a carriage with five axes of rotation.

The idea for using CAD was born during a visit to Sicob in 1979; eight months later it was a reality. Engineers had first been trained in industrial data processing, and they were assigned immediate applications tasks. Today, eight terminals are used for logic and machine power designs.

In the future, the system will be converted to CAD/CAM (computer aided manufacturing). Upon receipt of a file, the designer will send the part-machining program to one of the numerical control machines in the shop. For the time being, TMI-Forest writes its programs with Promo-assisted programming.

But CAD is only one of the elements of the enterprise's computer orientation, which is centered around an IBM 34 with 128K-memory. In parallel with its design work, the designer's terminal automatically transmits a parts inventory to the central computer, which draws from it information indispensible for supply. In addition, a Solar 16/40 computer with a 320K-memory gathers together the information collected by the time-keeping terminals in shops and offices. This extends beyond a computerized personnel management. Each worker or designer enters his badge in the appropriate terminal when he changes jobs or machines; as a result, the exact time needed to complete each part is readily determined. The time distribution of design shops is divided among the total parts of each run. The Solar 16/40, connected to the administrative services through the IBM 34, results in a double advantage: TMI-Forest adjust in real-time the cost of parts estimated by the sales department before the introduction of the machine. When the machine is finished, its exact cost is well known, thus ending the guessing game once and for all.

11,023
CSO: 3102/237

MANUFACTURING CELL DEMONSTRATED AT BRITISH EXHIBITION

Duesseldorf VDI NACHRICHTEN in German 9 Apr 82 p 4

[Article: "Multipurpose Robot Attends Standard Machine Tools"]

> [Text] A manufacturing cell unattended by human operators was exhibited at the British fair "Metcut" in late March and early April in Birmingham. Among other things, it consists of a CNC lathe, a conventional production milling machine, an industrial robot with computer control and costs about DM 700,000 including the interface for the milling machine and the robot's grippers.

The combination presently being exhibited in Birmingham clearly shows that automatic manufacturing cells do not have to be built exclusively around machine tools with CNC or other programable controls.

The small-computer based robot control "Acramatic" is the brain of the manufacturing cell. The CNC system is logically coupled with condition signals related, for example, to the machining process and can also control precision tool feed and thus can fully automate a processing system provided that the machine incorporates certain features that are common for CNC lathes and processing centers.

The T^3 industrial robot is positioned almost exactly in the center between the two machine tools which are arrayed back to back. This arrangement differs from the common practice for such manufacturing cells wherein the robot is stationed in front of the machines. It offers advantages such as space savings and safe, unobstructed access to the front of the machines for tool rigging and adjustment, inspection, maintenance and when required monitoring by a human attendant.

Insertion and removal of the workpieces from the back of the machines is possible only because of the T^3 robot's considerable reach and its agile hinged arm construction with six degrees of freedom. Two separate turning operations and one milling operation are performed on preprocessed blanks with a diameter of 100 mm and a length of 150 mm.

The hydraulically operated double gripper with two individually activated steel gripper pairs, which can grasp and transport the workpiece in various attitudes, provides for rapid change of work piece. After the first turning operation is finished, for example, the robot accomplishes a change of workpiece in three steps as follows:

--Gripper 1 grasps the machined part after which the chuck is loosened and the center stock is retracted. The new workpiece is held ready for insertion by gripper 2.
--The gripper mechanism describes an arc, stopping about halfway. During this pause a powerful jet of compressed air is blown over the chuck jaw to remove chips as the lathe spindle simultaneously makes a full turn.
--The arm resumes its arc motion and gripper 2 goes to the center of the spindle and inserts the new workpiece into the chuck. Finally, the gripper mechanism retracts completely from the work area of the machine.

The entire process of changing a workpiece from the initial grasping of a new blank to the release of the newly chucked part consumes not more than 15 seconds. Changing the workpiece on the milling machine involves the same sequence of steps: removal of the finished part; removal of chips from the chuck with compressed air and insertion of the new workpiece between the chuck and tail stock.

For the first lathe operation the unmachined blank is secured in a power operated chuck and the other end is center-supported on the tail stock which is likewise power operated. For the second turning operation, the automatically retracting tail stock is swung downward so that internal cutting tools can be brought into position. In the third and final step, six keyways are milled into the lathed part.

The T^3 robot in combination with several pallets which are arranged within its reach provides a system for transporting the workpiece through this manufacturing sequence. The input pallet consists of a simple metal frame encasing a thick wooden plate containing 30 drilled holes for holding the unmachined parts. The three-dimensional location of each of these 30 holes is stored in the robot's computer memory by a teaching process. With this stored information, the robot can locate, grasp and insert the blanks in the lathe in a prescribed order.

A similar output pallet also containing 30 holes serves as a receiver for the finished parts after the final milling operation. The finished parts are also deposited in a prescribed, memory-stored order in the output pallet since this is the most economical solution. However, it is also possible to locate the pallet positions in a free, or unspecified, order using modern sensor equipment, but this entails added costs.

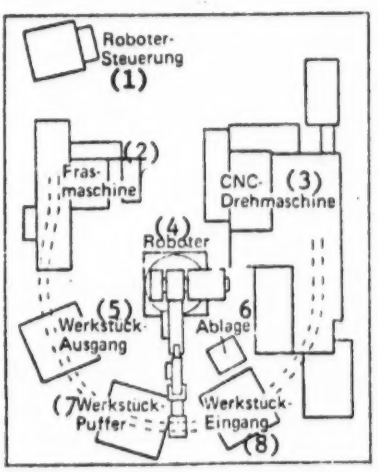
Two other workpiece handling stations are provided. The workpiece handling table has two separate pairs of prismatic supports on which the grippers can temporarily place the partially machined parts coming out of the lathe in preparation for the next machining operation. When initially lifting the workpiece out of the input pallet, the gripper grasps the blank very close

to that end of the 100-mm-diameter section which bears on the tail stock center so that the part can be solidly seated against the tripping lever of the open chuck jaw.

At the end of the first turning operation, the part is machined so close to the chuck that the gripper can not grasp it on the original diameter. However, the gripper's adjustment range permits it to grasp the partially machined part on the 55-mm-diameter section in order to remove it from the lathe and to lay it on the prismatic supports. At the point in time when this part will again be placed in the lathe for the second turning operation, the gripper grasps the short piece of the still unworked original diameter in order to shove the other end of the workpiece into the chuck. A buffer storage receives finished lathed parts if these yield while the milling machine, whose work cycle is not snychronized with the lathe, is still busy with another part. In practice this buffer storage can be used as an inspection bench for checking critical part dimensions, and when required a signal will be sent to the CNC control which will initiate an automatic adjustment to the lathe tools.

Figure Caption:

At the center of the manufacturing cell stands a T^3 industrial robot with six degrees of freedom and computer control. The workpiece input and output pallets have 30 workpiece receptacles in each case. The workpiece handling station permits the robot to make gripper manipulations between machine operations. The workpiece buffer storage serves to coordinate the unsynchronized duty cycles of the lathe and milling machine. The cell can still be expanded, for example by additional processing stations; inspection stations with or without automatic tool monitoring and/or compensation; automatic workpiece input and output conveyors instead of fixed input and output pallets, etc.



Key to Figure:

1. Robot control system
2. Milling machine
3. CNC lathe
4. Robot
5. Workpiece output station
6. Workpiece handling station
7. Workpiece buffer station
8. Workpiece input station

9160
CSO: 3102/287

INTERVIEW WITH HEAD OF AIRBUS INDUSTRIE

Rome AVIAZIONE in Italian Mar 82 pp 150-153

[Interview with Bernard Lathiere, president and "chief executive" of Airbus Industrie by Paul Denarie: "From Toulouse: We Have Beaten all Aircraft Builders including the Americans"]

> [Excerpts] We have been able to get 50 percent of the worldwide market for "big carriers." With the A320 we are planning to win 25-30 percent of the market. We are open to almost any offer of collaboration, even with the devil.

Toulouse--With the air transport crisis getting worse and with the oil crisis which is becoming a permanent fixture, there are not many particularly "happy" transport aircraft manufacturing industry leaders. In 1981, Boeing sold only 23 747-aircraft and four 767-aircraft; McDonnell Douglas had to be satisfied with eight DC-10 and Lockheed was able to sell only five Tristar aircraft. The latter then had to resign itself to announcing the end of the career of this three-engine aircraft[1] which inflicted heavy losses on the company and no more than 21 aircraft are to be delivered between now and the end of 1984.

On the other hand, Bernard Lathiere, the general manager of Airbus Industrie, 53 this spring, keeps smiling. This is because he has some good products and because the Airbus family is selling rather well. "The year 1981," he says, "was a good year. With 46 firm orders and 30 options, we sold almost the same number of aircraft as the year before (50+36) during a period when the crisis had not yet reached its current magnitude. In 1981 we thus got 50 percent of the worldwide market for big carriers as against 24 percent in 1980 and we got 82 percent of the market for medium-range, wide-body aircraft. We beat the three combined American aircraft manufacturers."

Lathiere continues: "This gives us a total of 505 Airbus sold, including, 346 firm (258 A300 and 88 A310) plus 159 on options (69 A300 and 90 A310). The total number of orders comes to 158 aircraft for 26 companies of which 39 were delivered to 19 operators last year. This means that we still have 347 aircraft to deliver. Even though the time of the 'big race' is over, it is reasonable to think that we will arrive at a figure of 1,000 aircraft."

[Question] This is a nice figure but do you not think that the figures will be less wonderful in 1982?

[Answer] No, we think that we will maintain the same sales pace. The 500th Airbus should come off the assembly line in the spring of 1986 and we will continue to increase the output rate. The latter rose from 3.6 aircraft per month at the end of 1980 to 4.2 aircraft at the end of 1981 and, as planned, we will get up to 8 aircraft per month by the end of 1984. During the signing of the contracts for the 747 and for the Airbus with Singapore Airlines, on 15 December, Boeing Chairman Thornton A. Wilson asked me: "We have already laid off 6,000 persons and we are about to lay off another 12,000. How many people are you about to lay off?" I replied: I am hiring. Right now there are 20,000 persons in Europe who are working for Airbus Industrie; within 3 years we are going to have 45,000 at the peak of the production rate with the arrival of the small Airbus A320 which has 150 seats.

[Question] What are the big events anticipated by Airbus Industrie in 1982?

[Answer] First of all, on 18 January we delivered the first large-capacity aircraft to Garuda with only two pilots. Then, in the spring, by the end of March, we will have the first flight of A310. Finally, in the summer, we will effectively launch the A320.

[Question] Could you briefly review those programs for us?

[Answer] You mean the A300? The first versions, B2/B4, are becoming more difficult to sell with the appearance of the B4-600 during the second quarter of 1983 which will be available a year later. Considering the fact that, in times of crisis, smaller aircraft sell better, the A310 is at this time the easiest to sell. However, we will deliver about 50 B2/B4 this year and quite a few more after that date.

[Question] According to some people, sales of the A310 are taking off slowly. What do you think about that?

[Answer] Nothing, as a matter of fact. We sold 178 A310 aircraft even before the aircraft made its first flight, whereas we had only sold 31 aircraft prior to the maiden flight of the A300 on 28 October 1972.

[Question] Can French arms sales to Nicaragua slow down sales in certain countries as in the case of Abu Daud [Abu Davi] which, it is said, cancelled the order of Western Airlines?

[Answer] No, but our competitors can exploit that situation and can put the skull and crossbones on the French flag. That would not exactly be fair play but all is fair in war.

[Question] Boeing staged a big ceremony for the rollout of the 757 at Seattle. Are you going to do the same for the A310?

[Answer] We have decided not to do anything of that kind. A rollout costs half the price of a show such as Farnborough. The A310 is a member of the Airbus family. It is No 162 in that line. It therefore is not an entirely new aircraft. Our idea is to make personalized presentations on the order of the delivery of the aircraft to each client. The aircraft, which is the first

of Swissair, will be painted on one side with the colors of the Swiss company and on the other side with those of Lufthansa which will get the third A310 (No 191 in the line) in the spring of 1984.

[Question] Certain carriers are asking you to space the shipments out. What is the situation between you and Laker at this time?

[Answer] Laker is having problems with its banks. It is not its three Airbus aircraft which lost money; they lost money with the DC-10 on the trans-Atlantic lines. This situation should be cleared up in one way or the other within a few weeks. In the past, certain postponements, especially in Europe, enabled us to sign contracts with neighboring lines, particularly with VASP (three A300B2, ordered on 30 October 1980, to be delivered by the end of 1982).

[Question] Did the fact that socialists came to power in France on 10 May of last year change anything as far as Airbus Industrie is concerned?

[Answer] Nothing has changed as far as our European partners are concerned. But I did have to explain to the United States that the Airbus could always fly also if a communist minister was in charge of transportation (in France--editor's note].

[Question] Let us now take up the A320. It does not look as if it would be moving too fast.

[Answer] Important representatives of Delta Airlines are now in Toulouse with the company's number two man. They need almost 120 aircraft; that would give us 200 aircraft with Air France which signed an order for 25+25 A320 on 6 June of last year. Their visit to France does not mean that they are going to buy but it does demonstrate their interest. If they should decide, another big American company (Continental? Eastern?) could decide to fly those planes. But I want to make it clear that the launching of the A320 does not depend on any possible order from Delta. If they do not order anything, that could not slow down the launching of the program.

[Question] In your opinion, is the time for decision far off?

[Answer] Yes, I would have preferred to have Delta decide at the beginning of last autumn but 6 years would have been necessary to launch the A310! Delta can become one of the launching companies together with Air France but six other carriers in Europe, in Africa, in Asia, and in America are already interested in the program. Yes, they do include British Caldedonian.

[Question] What is the market for the A320?

[Answer] The market for this category of aircraft ranges from 3,000 to 3,100 aircraft. One part will be taken up by the 737-300 (20+40 ordered so far) and the DC-9-80 (114+21). But the real competition of the A320 will undoubtedly be the 150-seat Seven-Dash-Seven which Boeing could propose next for 1987. With the A320 we are thinking of winning 25-30 percent of the market, in other words, a minimum of 700 aircraft.

[Question] And what do you think of the MDF-100 project of McDonnell Douglas-Fokker?

[Answer] On that market I do not see a third competitor capable of spending $2 billion for such an aircraft [as published].

[Question] Is the cost of launching the A320 therefore on this order of magnitude?

[Answer] Yes, between $1.5 and $2 billion, with a unit price of $20-25 million per aircraft, in other words, half of the price of an A300/A310.

[Question] But for the time being, the A320 does not have an engine. Can you launch an aircraft without the engine while the development of a power plant takes longer than that of an aircraft?

[Answer] As a matter of fact, apart from the Rolls-Royce-IHI, there are no entirely new engines; these are improved versions. Pratt & Whitney, together with FIAT Aviazione and MTU [Motor and Turbine Union], offer us the PW2025; the British and the Japanese offer us the RJ.500-35; SNECMA [National Corporation for Aircraft Engine Design and Construction] and General Electric, through CFM International, are offering us a derivative, 2.K.1, of the CFM56, which will be available by 1986. Only SNECMA--because General Electric does not wish to share in this risk--is offering us an M56-2000 with a thrust of 11,500 kg which will not arrive before 1990; for it, we would have to find Fr600 million. The offer from SNECMA is not the way to go because we are asking for engines that would be much more powerful than the ones available now and that is not true of the CFM56-2.K.1 which is a French engine on a European aircraft; even if it were to arrive in time, it would be difficult to sell it abroad. Today, an engine can be made only through joint international production. There is a certain danger in seeing the engine-makers dragging their feet at a time when there is not a single builder ready to launch a program in this category, above all at a time when we need engines with definitely higher performance than those we have now. But if Delta, for example, were to decide in favor of the A320, the very next day, we would immediately have three engine-makers drop in on us.

[Question] How will the work on the A320 be distributed?

[Answer] In the context of the current partners, the problem is not simple. France could build the fuselage and the cockpit; Great Britain could make the wings. But the British tell us: "We do not want to keep on making just the wings and lose out on assembly and on the cockpit. We also want the cockpit." The Germans are less hesitant; they are asking us to do practically the same thing (which they are doing for the A300 and the 310--editor's note). We are discussing with the Italians and with the Spanish CASA [Harvester Suppliers, Incorporated] and last May we signed an agreement with the Yugoslav Soko Company for about one-percent cooperation. Lately we drew up a memorandum of understanding with three Australian builders who are planning to participate with 2 or 3 percent. The Belgians would like to go up from 2 percent to 4 percent and De Havilland of Canada has asked the Canadian government to be able to cooperate in the operation with a share of 10 percent from the development stage on ("full partnership").

[Question] What about the Japanese? And what about Fokker if the MDF-100 program does not get off the ground?[2]

[Answer] As far as the Japanese are concerned, the problem is very simple. We do not want to work with people on a completely new aircraft in order then a short time later to find ourselves facing a new competitor, as happened in the case of the shipyards. We already told them that but they want you to talk clearly, they want you to talk the kind of language they understand. Fooker? We are open to any offer of collaboration, even with the devil.

[Question] It seems that there has not been any talk for quite some time about the TA9/TA11 projects.

[Answer] We are doing a little less work now because we gave priority to the A320. The TA9 is bigger and more difficult to sell at this time. As for the long-range, four-jet TA11, that would be set back by the launching of a very long-range version with the action radius of the A310, in other words, 6,000 km instead of 4,800 which was asked for. This aircraft could be a good substitute for the DC-10 and the L-1011 which are not flying at full load on all of the trans-Atlantic lines. United States regulations force a twin-engine aircraft to fly at least 60 minutes from an airport whereas those of the OACI call for at least 90 minutes. We are no longer in the times of Mermoz when you had to have at least four engines before going out over the sea. And since Boeing is thinking of a long-range 767, will we perhaps see an amendment of this regulation?

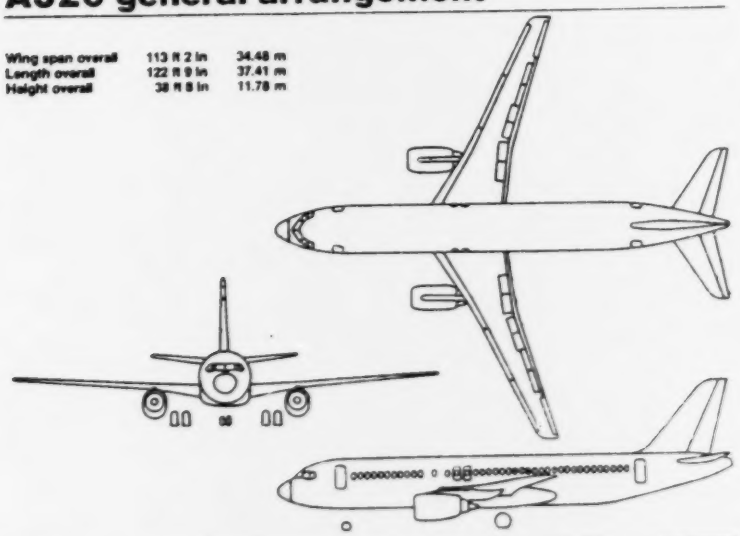
FOOTNOTES

1. See AVIAZIONE, No 161.

2. The interview took place before the announcement of the termination of the agreement for the MDF-100.

A320 general arrangement

Wing span overall	113 ft 2 in	34.48 m
Length overall	122 ft 9 in	37.41 m
Height overall	38 ft 8 in	11.78 m



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A320 design data

	A320-100		
Max. take-off weight	68 000 kg	145 500 lb	71 900 k
Max. landing weight	61 463 kg	135 500 lb	62 863 k
Max. zero-fuel weight	57 607 kg	127 000 lb	59 077 k
Operating weight empty	39 248 kg	86 525 lb	39 656 k
Max. weight limited payload	18 359 kg	40 475 lb	19 421 kg
Seating, all economy 32" pitch	162		162
Passenger and baggage payload	14 697 kg	32 400 lb	14 697 kg
Cargo payload	3 862 kg	8 075 lb	4 724 kg
Hold capacity - forward	15.09 m³		
- aft	25.66 m³		
- total	40.75 m³		
Maximum fuel capacity	12 900 kg	28 440 lb	16 800 kg

Airbus Industrie Sales as of 15 January 1982

A 300 + A 310 : 505 to 43 companies
or : 346 firm orders
+ 159 options

including:

A 300 : 258 firm orders
+ 69 options

A310 : 88 firm orders
+ 90 options

Delivers : 158 to 26 companies

A 320 : 25 firm orders
+ 25 options

Orders Received in 1981

			[1] fermes		options
6. II.8I	Thaï International	:	2 B4-600	+	2 B4-600
23. II.8I	T.A.A.	:+	I B4-I00°		
I8.III.8I	Garuda	:+	3 B4-200°		
25.III.8I	Wardair	:	6 A 3I0	+	6 A 3I0
I3. IV.8I	China A.L.	:+	I B4-200°		
I7. IV.8I	Nigeria A.W.	:	4 A 3I0	+	4 A 3I0
II. VI.8I	South African	:+	I B4-200°		
I. IX.8I	Indian Airlines	:+	2 B4-200°	+	2 B4-200
I5. IX.8I	Libyan Arab A.L.	:	6 A 300 4 A 3I0		
25. IX.8I	Egyptair	:+	2 B4-200		
.. IX.8I	Unannounced	:+	2 A 300°		
30. X.8I	Middle East	:	5 A 3I0	+	I4 A 3I0
I5.XII.8I	Singapore A.L.	:+	6 B4-200	+	2 A 3I0
3I.XII.8I	Egyptair	:+	I B4-200		

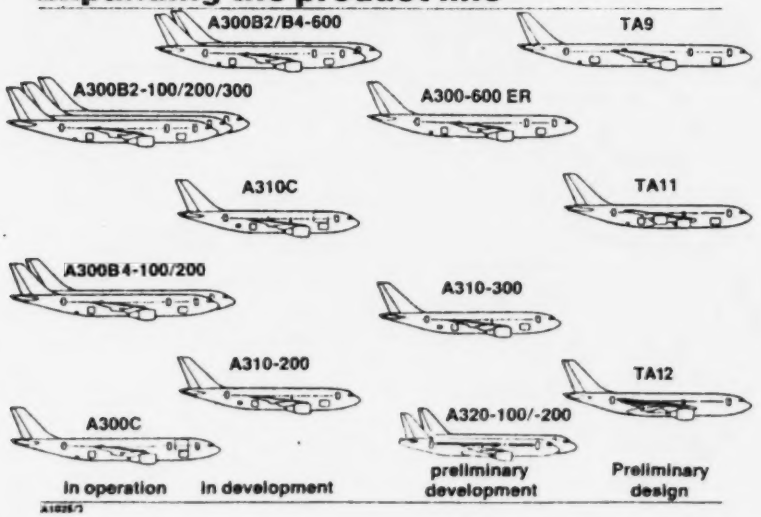
total:..... 46 fermes[1] + 30 options
(° = options converties)

M.O.U.(memorandum of understanding)[3] : [2]

2 B4-200 = commande Air Jamaïca du 8.I.I982
2 A 3I0 = unannounced company
3 A 3I0 = unannonnced company

Key: 1--Firm; 2--Converted options; 3--Order form.

Expanding the product line



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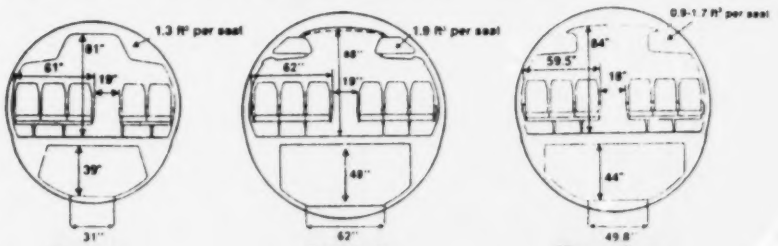
A320 cross section comparison



Stowage capacity based on 32 inch pitch seating

The A320 provides distinct marketing advantages necessary for an aircraft intended for service into the 1990s.

- wider seats
- greater adaptability
- more carry-on capacity
- improved underfloor features

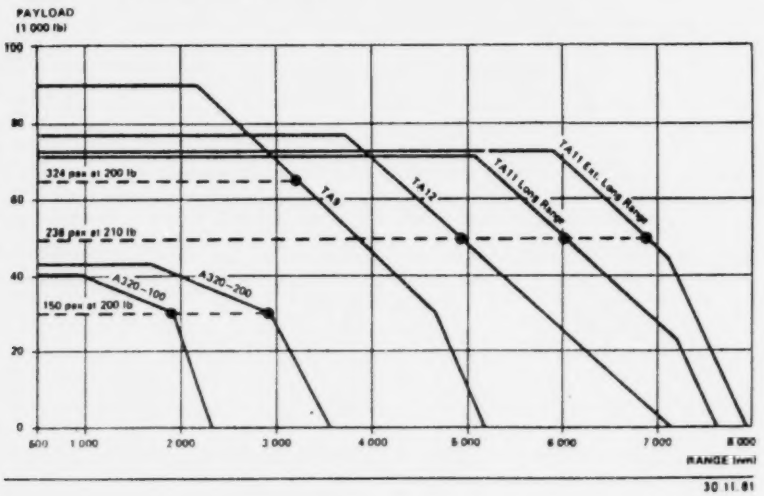
A32 P 22.10 1

Payload range comparison

Range with full pax and baggage (mixed class)

AI Standard OWE's, FAR domestic reserves for A320 –100/200 and TA9

FAR international reserves for TA11 and TA12



5058
CSO: 31o2/273

TRANSPORTATION

SWEDEN USES ADVANCED TECHNOLOGY IN CONSTRUCTING SF 340

Stuttgart FLUG REVUE in German Jun 82 p 61

[Article by Hans Redemann: "Ultra-Modern Aircraft Engineering"]

> [Text] Sweden is begining the production of the new commuter aircraft by Saab and Fairchild. It will be a technical delicacy with a glued airframe and the most modern electronic equipment.

After detailed market studies, the manufacturing firms Saab-Scania of Sweden and Fairchild of the United States in June 1979 decided on the joint development of a twin-engine commuter aircraft in the weight category of around 10 t. The contract was signed and the attendant decision on the project definition phase for the new aircraft under the designation SF 340 took place just 6 months later.

Depending upon the load, it is designed for ranges of up to 3,200 km. Its maximum passenger capacity is 34 and the passengers are seated in a pressurized cabin with variable interior furnishings and an aisle height of 1.82 m. The SF 340 was designed for a lifetime of 45,000 flying hours.

After longer decision preparations, the designers in June 1980 selected 2,177-kw turboprops of the General Electric CT7-5 type as the power plant; they are supposed to help the SF 340 to attain a cruising speed of about 500 km/hr. This engine proved to be superior to other engines. It was derived from the T700 helicopter engine and according to reports from General Electric, the fuel consumption of the CT7-5 is almost 20 percent less than that of the comparable engines in its performance class.

In selecting the airscrews, the design team settled on a four-blade propeller in the composite [sandwich] design which was developed by Dowty Rotol. With the help of a novel gear, this automatically adjustable propeller, with a diameter of 320 m, turns at only 1,380 rpm. A correspondingly modified Gulfstream I has been picked as the flying test stand for the SF 340 engine. The fuel system consists of two, each, integral containers in the wings with a capacity totalling 3,330 liters.

The SF 340 program has made considerable progress since the start of work. After the first order was received in November 1980, Saab-Fairchild now has

60 firm orders and options. The first operator will be Crossair, a Swiss regional company, which has ordered 10 aircraft alone. But several American commuter airlines are also on the customer list. The basic version of the SF 340 presently costs $4.75 million.

The production of the first of two model aircraft has been started at Saab in Linkoeping. The rollout is scheduled for November of this year and it is to go into flight testing early in 1983. Licensing for the United States and Europe will also come through during that year so that one can expect the delivery of the first series-produced aircraft early in 1984. A completely new shop complex was erected for the production of the SF 340 in Linkoeping at a cost of 200 million Swedish Crowns (DM80 million). This plant is currently already gluing complete side shells for the center section of the fuselage with longitudinal profiles and window frames and they are being prepared for series production.

Commuter air travel undoubtedly will get new impetus from the highly promising Saab-Fairchild 340. Its direct competitor models are not only the EMB-120 Brasilia and the French-Italian AS 35/AI T 230, but also the Dash 8 of de Havilland of Canada.

5058
CSO: 3102/309

BRIEFS

METHANOL-POWERED COMMERCIAL VEHICLES--Frankfurt, 25 May--Five heavy city cleaning trucks were equipped with a methanol engine for the first time in Berlin. Half a year ago already, six VW vehicles of the Berlin City Cleaning Enterprises were converted to that same type of motor. In this way, the Berlin City Cleaning Enterprises are continuing their series of experiments to test environmentally safe drive methods which began in 1977 with the equipment of two vehicles with electric motors. The engines of the newly commissioned Magirus-Eutz/Iveco trucks were developed by Kloeckner-Humboldt-Deutz AG [Incorporated] as part of a project promoted by the Federal Ministry of Research and Technology. The Department of Applied Thermodynamics of the Aachen Technical College was also involved. In this process, a series-produced diesel engine was converted for operation with methanol and it is hoped that this will result in extensively soot-free and odorless operation. The decisive characteristic of this engine is the pilot injection method where a small quantity of diesel fuel is sprayed directly as ignition oil from an accessory spray unit into the combustion chamber of the engine shortly before the methanol quantity. The ignition oil is ignited as in the conventional diesel engine by the compression heat and thus causes the subsequently injected methanol to explode, according to a report from Iveco. Methanol, as an alternate fuel, is obtained mostly from coal and natural gas. But it can also be made from wood, plants, or urban waste. Because the community-owned vehicles, as in the case of Berlin, operate from certain yards or dumps, it would not be necessary to build up a major network of gas stations for methanol. [Text] [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 26 May 82 p 5] 5058

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END

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2 JULY 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 109

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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JPRS 81205

2 July 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

No. 109

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SWEDISH INDUSTRIES' INTEREST IN BIOTECHNOLOGY INCREASING

Stockholm SVENSKA DAGBLADET in Swedish 18 May 82 p 20

[Article by Karin Henriksson]

[Text] "Over the past 20 years, a long list of today's raw materials have been replaced by microorganisms. Biomass consisting of household and industrial waste provides energy, blood plasma is produced by microorganisms, the forest industry's waste is converted into chemicals, oil spills are cleaned up by microbes, bacteria maximize the extraction of metal in the mining industry, and so on."

The man painting that scenario is Bertil Aberg, managing director of KabiGen. KabiGen (whose capital is equally divided between the state-owned KabiVitrum and Cardo) wrote the world's first hybrid DNA contract in 1977.

Following a great many rounds of debate and efforts to obtain permits, production of the growth hormone hGH will soon begin in Strangnas. Thanks to hGH, the six to eight dwarfs that result from every million births can grow normally. The hormone is currently produced from pituitary glands taken from corpses and is very expensive. The hGH that will soon be cultivated in 1,000-liter batches with the help of bacteria will supply all of the world's needs.

Bertil Aberg says: "The growth hormone also has another market that could not be supplied until now due to the lack of raw material. It is probable that hGH will have very good effects on both complicated bone fractures and skin burns."

Biotechnical Arrogance?

This new-old field of biotechnology is hemmed in by a long list of questions:

Will it revolutionize industrial production and create markets worth billions? Will it replace our familiar basic industries? Can we even imagine its future areas of application?

Also this: has Sweden been left behind in the international race?

There has been talk of "biotechnical arrogance"--that it takes longer and is more difficult than one thinks to transfer sophisticated biotechnical ideas from the test tube to a full-scale industrial operation.

But those sophisticated biotechnical methods--of which hybrid DNA is only one--have come to be of great importance to drug manufacturing, and their importance will soon increase. Ethanol and gas from improved fermentation processes may be able to replace large quantities of petroleum.

As to the question of whether Sweden has fallen behind, the answer is both yes and no.

Most people agree that the inflamed debate over hybrid DNA delayed things. And the regulations governing research and production are still considerably stiffer here than in the United States.

Small but Good

Sweden is naturally also small in this connection. Here we have between 30 and 40 hybrid DNA researchers, while the United States has several thousand. But research at both the Biomedical Center in Uppsala and the Institute of Microbiology in Umea is considered to be of a high international standard. In Umea, for example, according to researcher Bengtake Jaurin, two big projects are underway. Both are being carried out in cooperation with KabiGen. One is concerned with gamma interferon (the interferon that is most active), and the other is concerned with plasminogen activators (substances that dissolve blood clots). According to Bengtake Jaurin, it will be 1 or 2 years before industrial production is possible.

Like the Fortia concern in Uppsala, KabiGen is well out in front when it comes to diagnostics and drugs. The other big drug producer, Astra, feels that it really makes no difference how drugs are produced, according to research director Stig Agurell. Biotechnology will not be worthwhile unless it leads to cheaper production or unless something new can be produced. But Stig Agurell also mentions that certain biotechnical ideas are currently being studied by his firm.

Exports Already

Equipment for biotechnical research and production is already an important export item. Actually, it is a further development of old Swedish traditions--meaning separators!

Fortia is offsetting a reduced demand for biochemical equipment with increased sales of filtering and separation equipment for genetic research, among other things.

LKB Products produces laboratory equipment (turnover: about 420 million kronor), 95 percent of which is exported. Research chief Lennart Arlinger says:

"Despite Reagan's cutbacks in research appropriations, we have been more than compensated by increased sales of instruments for the analysis of biotechnical processes. A modern fluid chromatographic system that combines the biochemist's requirements with the most modern biotechnology was put on the market just recently, and it has been well received around the world."

Alfa-Laval and the Sugar Corporation (partly through the latter's subsidiary SORIGONA) are investing heavily in the next step--that is, industrial production, which will require fermentation and chemical processing facilities.

Torsten Ryhl, manager of the Sugar Corporation, says: "Thanks to 30 years of industrial experience based in part on SORIGONA's production of dextran, we have biotechnical know-how that the new genetic firms lack. We have come a long way in upgrading fermentation and in combining various biotechnical methods."

Grain into Alcohol

Alfa-Laval is only a signature away from cooperation with the Swedish Farmers Purchasing and Marketing Association in Lidkoping. Surplus grain that is currently being exported at low prices for use as hog feed will be fermented into 20,000 liters of alcohol per day. The government is contributing a portion of the nearly 40 million kronor that the facility will cost, and the OK [Swedish Oil Consumers' Union] has already announced that it is interested in blending ethanol with expensive gasoline, according to Carl-Gustaf Rosen, head of research for the Alfa-Laval industrial group.

He says: "Biotechnology is playing a part in more and more of our areas of activity. Our subsidiary Ewos, for example, produces vaccine and feed. So we are increasing our research efforts all the time."

Harald Skogman, who is head of SORIGONA (turnover: 30 million kronor), says:

"Of the world's three or four producers of the amino acid tryptophan, we are really the only one that produces it by a large-scale fermentation process. It is accomplished with the help of a genetically altered organism, and in this area we have come a long way. We are also concentrating our efforts on so-called anaerobic fermentation and methane fermentation. Several industries--food and cellulose manufacturers and breweries, for example--have expressed an interest in converting their waste into energy."

High Level of Engineering Skill

In Sweden, the government invests 22 million kronor per year in biotechnology through the STU (National Board for Technical Development) and other organizations. It is estimated by the Swedish Academy of Engineering Sciences that industry invests three times that much.

Gustaf Brunius, secretary of the Delegation for Hybrid DNA Matters, which is part of the National Board of Occupational Safety and Health, says: "With the exception of KabiGen, we missed the first race. Now the second and much more important one is coming up, and this time the development of knowledge will be the be-all and end-all. The number of people working in biotechnology in Sweden is critically on the low side.

"One obstacle is the fact that this phase--developing molecular and engineering skills--is terribly expensive. The rate of 'laboratory inflation' is high:

price increases on special chemicals are amounting to close to 50 percent. And applied microbiology is not highly regarded in Sweden."

Gustaf Brunius also talks about activities at the Foundation for Biotechnical Research (which has 25 Scandinavian firms as members). The foundation raises money for certain kinds of basic research, but it also has the job of disseminating information on biotechnology. A series of courses intended for the firms are currently being planned.

Gustaf Brunius says: "The foundation wants to help see that researchers' ideas become finished products. New bioengineering firms should be small firms of the entrepreneur type which can absorb fresh ideas but which can also be phased out if necessary."

Prepare!

Gordon Edge comes to visit from Great Britain from time to time. He is head of a department in the international consulting firm of PA International, which has a subsidiary in Sweden called EF Business Development. Biotechnical research is also conducted by PA International. His opinion and advice are as follows:

"Sweden is good at technology and at developing technology. In this case, people in every firm should sit down and think about it this way: how are my products threatened by biotechnological progress, and how can I myself use biotechnology in the future?"

In Gordon Edge's scenario, genetic engineers may drive the wool and silk fiber produced by sheep and silkworms off the market. Petrochemical plastics will be replaced by biotechnical polymers with superior qualities. Environmental poisons in the air and water will be measured quickly by biotechnical methods. And looking into the future, he says there are signs that light will be produced using the characteristics of fireflies.

How prepared are the industries that are usually mentioned in these biotechnical visions of the future?

Chemistry: Around the turn of the century, biotechnology may become a substitute for petrochemicals, according to Erik Brandt, managing director of the Association of Swedish Chemical Industries. He points out, however, that raw materials for bioengineering processes are also becoming more expensive. As far as fine chemicals (pharmaceuticals, for example) are concerned, a number of firms have already come a long way. Others are more or less waiting to see what happens. Erik Brandt says: "This may be a matter of education: the firms lack personnel receptive to the new technology."

Forestry: The pulp and paper industry is very receptive to the idea of using forest fuel, according to various publications from that industry's association.

Ore Extraction

Mining: Today's ore prices have caused the mining firms to show greater interest, according to Rolf Hallberg, who is in charge of research at Stockholm University's Geological Institute. A pilot project will start up this fall at the Gronhog Mine near Atvidaberg. Bacteria can be used to loosen the ore from the rock. That will reduce the ore content requirements in conventional mining, while also making it possible to recover ores that remain in mines which have already been shut down.

Plant Breeding: Experiments for the genetic manipulation of plant cells will begin in a few weeks at Uppsala University's Institute for Physiological Botany. It has not yet been possible to demonstrate that plant cells can incorporate isolated foreign DNA, according to Prof Tage Eriksson. The Svalof Corporation believes that the technology will come, but as yet it has not included it in its program.

Superficial Contacts Between Firms

Cardo's Hilleshog firm is involved in advanced research on conifers. But no information on Hilleshog's plant breeding or its view of biotechnology's possibilities can be provided. According to a directive from the managing director, he is the only one who is to give out information--and then only if one writes to him a month in advance.

Cooperation between research institutes and firms is said to be very important, and it seems to exist to a significant degree in Sweden. But does cooperation between the firms themselves--to develop new ideas and technologies jointly--exist?

"Yes," says Bertil Aberg of KabiGen, "but the contacts are still superficial, and there are not many inquiries."

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CSO: 3102/294

WORLD'S LARGEST BIOGAS PLANT NEAR MUNICH

Zurich CHEMISCHE RUNDSCHAU in German 21 Apr 82 p 3

[Article: "World's Largest Biogas Plant"]

> [Text] In Ismaning near Munich, the world's largest biogas plant has gone into operation. In reference to this event, the Federal Research Minister stated: "Biogas technology can achieve an important position in agriculture. Even if this technology can provide only a small fraction of the total primary energy consumed, it is still to be welcomed as a contribution to a decentralized energy production and supply system." Messerschmidt-Boelkow-Blohm (MBB) is responsible for execution of the overall project.

The new biogas facility involves a large installation which is in no way comparable to home-built plants. Through further development of the process, significantly higher gas output has been achieved. The Ismaning plant has a reaction volume of 1,000 m^3. Whereas daily gas output from ordinary biogas plants is about 1 m^3 per m^3 of reaction volume, a fourfold improvement in efficiency is expected from the new type installation. The yield is expected to reach the heating equivalent of 2,000 l of heating oil per day. The decomposed manure can be spread on fields as high quality natural fertilizer. The primary difference in comparison to other biogas installations--besides size--is phase separation. This increases the material conversion rate by about a factor of five, ensures operational safety and provides, within limits, on-demand gas production. Process heat is extracted from the decaying manure bed and delivered to the fresh biomass by a heat exchanger system. Only the surplus heat is diverted for external uses such as heating water. The heat reclamation cycle cuts the plant's operational energy requirement about in half.

The biogas generated by the bioreactor during postfermentation of the substrate is collected in a pillow-shaped storage bag. The bag floats with open side down on the manure bed at the bottom of a pit. The manure accumulates in the pit until such time as it is removed for use as fertilizer.

Advantages resulting from this new development are:

--Increase in material conversion rate by factors of 3 to 5,

--Safer plant operation,

--On-demand gas production (within limits),

--Lower operational energy requirements, about 25 percent in winter and 10 percent in summer,

--Lower insulation and maintenance costs, and

--Increased yield through storage of the postfermentation gas.

The method is potentially applicable where plant and/or animal biomass is produced in surplus or continuously accumulates as a by-product; where there is a significant, continuous demand for energy along with the potential for distributing it and where the accumulation of decomposeable materials and the emission of odors is to be prevented. Examples: food processing industry, slaughter houses, sugar refineries, dairies, distilleries and canneries.

If anaerobic decomposition takes place in the thermophilic temperature range around 55 degrees C, then the area of application can be further expanded since the substrate is hygienized during decomposition.

PHOTO CAPTION:

This world's largest biogas research plant in Ismaning near Munich supplies energy and fertilizer to an agricultural enterprise. The project was aided by BMFT funds and was carried out by MBB Ottobrunn.

9160
CSO: 3102/292

ELECTRONICS

SEVENTEEN MAKERS OF 64 KBIT RAM'S LISTED

Paris ELECTRONIQUE ACTUALITES in French 2 Apr 82 p 33

[Unsigned article]

[Text] Covering the first quarter of 1982, a Semiconductor Industry Association study listed some 17 manufacturers of 64K dynamic RAM memories; the list does not include companies which produce these components for their own needs, such as IBM or Western Electric.

Reproduced in the attached table, the list is only tentative: according to the association, ITT will enter the 64K market in Europe, and will be the second-largest manufacturer of memories of this size, after Siemens. In the United States, also according to the association, some companies, such as AMD, have deferred their introduction dates while waiting for the formation of a uniform price policy.

The size of 64K RAM chips varies significantly from one manufacturer to another. National Semiconductor, Micron Technology, and Inmos hold the miniaturization record, while Motorola uses a relatively conservative technology with a circuit of nearly 32 square-mm.

The seven major Japanese manufacturers have also adopted large chip sizes, maintaining the 16K-cell design but optimizing marketing techniques. Eliminating the risks inherent in a new design, these companies have bet primarily on market coverage, being capable of rapidly producing the 64K DRAM devices at an industrial rate.

Siemens in turn, has launched a 64K whose chip area reaches 29.6 square-mm; two versions are offered with two different access times (150 or 200 ns), both of them with a redundant bit.

Production of 64K dynamic RAM memories (Semiconductor Industry Association)

Manufacturers	Stage of development	Chip size (square-mm)
AMD	sampling	23.38
Fairchild	sampling	23.86
Fujitsu	production	--
Hitachi	production	--
Inmos	sampling	21.28
Intel	sampling	--
Matsushita	production	--
Micron Technology	production	21.28
Mitsubishi	production	--
Mostek	production	26.44
Motorola	production	32.25
National Semiconductor	sampling	18.70
NEC	production	--
OKI	production	--
Siemens	sampling	29.67
Texas Instruments	production	21.28
Toshiba	production	--

11,023
CSO: 3102/244

RTC SAMPLES ITS FIRST INTEGRATED BIPOLAR MOS

Paris ELECTRONIQUE ACTUALITES in French 2 Apr 82 p 38

[Article by J. P. Della Mussia]

[Text] In May, RTC should begin sampling its first power component, integrating an MOS transistor and a bipolar transistor on the same chip, in a Darlington circuit; this combination was named BIP MOS by Thomson-CSF one year ago.

This device will be able to carry 5 A or 500 V (as Vces and not Vceosus) and switch in 500 ns; the saturation voltage is 2 V with a gate voltage of 10 V. This is first and foremost a test component for RTC. In particular, its chip area, at 25 square-mm, currently corresponds to the best possible compromise for chip area/industrial fabrication yield, but the announced characteristics do not correspond to any particular marketing objective (however, RTC lists the industrial sector, automobiles, audio, and so on, among the possible uses). Maybe users will find interesting applications at the cost of a few current and voltage modifications. No price is presently quoted by RTC. But should an important utilization open up, this price in our opinion could eventually drop to 15 F in a TO 220 package and in large quantities.

Searching for a Compromise

Power MOS devices offer many advantages that bipolar transistors do not have: high input impedance, low switching time, absence of secondary breakdown. But starting with 5 A at 400 V, the MOS requires a large and therefore expensive chip area to reduce the conduction resistance. Moreover, the gate capacity then exceeds 1500 pF, making it difficult to build a control circuit. Hence the idea of combining in a Darlington configuration, a small input MOS and an output bipolar transistor; the MOS contributes its high input impedance, and the bipolar its low cost per switched ampere.

Supertex has already marketed such a completely integrated BIPMOS; Thomson-CSF is offering a hybrid one; and many users create the circuit from discrete devices, an approach which has the advantage of adapting the input and output exactly to the planned application, at a cost which will still remain the most attractive for another one or two years at least.

RTC on the other hand, has perfected in its Caen plant, a device using a D-MOS with 200 pF input capacitance, and a fast bipolar transistor. A 10 ohm resistance integrated between the base and emitter of the output transistor also improves the switching time of the device, as well as its resistance to secondary breakdown.

The BIPMOS voltage rating is specified in Vces. It is indeed known that for a D-MOS, as opposed to a bipolar, the value of Vces and that of Vceosus is the same. Users who want to use this BIPMOS at the Vcesosus voltage will therefore have to wire for a voltage of about only 200 V because of the bipolar transistor (all the values quoted are typical and for 25 degrees C).

RTC has not yet decided which package to use for its BIPMOS. Let us hope it will be a 4-pin model (with the base of the bipolar transistor in the output) so that users will be able to rapidly test this component as a function of their needs.

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CSO: 3102/244

ELECTRONICS

JAPANESE OFFER BRITISH ACCESS TO FIFTH-GENERATION TECHNOLOGY

Paris ZERO UN INFORMATIQUE HEBDO in French 13 Apr 82 p 10

[Article by Rex Malix]

[Text] The Japanese appetite does not seem to be limited to the recent agreements reached between ICL and Fujitsu. In exchange for a participation whose terms are not clearly defined, the British could have access to the results of the very ambitious Japanese program whose goal is to achieve within ten years, performances a hundred times better than those of the Cray 1 (see 01 HEBDO No 689).

What response should the English make to these proposals to participate in the development of fifth-generation computers (proposals that were also made to the French last fall, during a conference in Tokyo)? This is the difficult question that is being raised today.

While the Japanese have not yet actually specified the method of participation in this project, they obviously want to derive great profit from it. The English, whose answer is not yet fully known, did not want to close the doors on all negotiations, and in the meantime are envisaging ways and means to maintain secrecy about research and projects being conducted on strategic points.

Focusing on this topic, a meeting was organized to gather together the majority of chief executives in private and public research centers, the technical directors of the major electronics companies, as well as Robert Wilmot, president of ICL. Another aim of this meeting, was to disclose, as a prologue, the proposals of the Ministry of Industry for improving research in the computer sector.

These proposals amount to an addition of 250 million pounds to the current expenditures for the next five years, and seek to emphasize the effort being made in five specific domains: component integration and the VLSI (very large scale integration) program, networking and local networking in particular, software engineering, artificial intelligence and dedicated systems, and finally, data architecture. These fields were selected for the simple reason that they are areas in which the British have acquired good experience and in which they are relatively advanced.

In England, research institutes traditionally carry out their work as separate entities. Aiming to change this situation, the project proposes to join their research and development efforts, patterning themselves after the method used by the Japanese in centers financed entirely by the government.

Product development should not require financing, and operating costs would be shared by the partner companies. Intended primarily for research, this center would also have commercial interests.

From the beginning of the conference, the participants seemed to agree that the Japanese program was realistic, even if it did not end up ten years from now in the construction of a computer built entirely of VLSI components and a hundred times more powerful than the Cray 1 (see 01 HEBDO No 684).

At the same time, it appeared clear that the Japanese wanted to force the events by staging according to their concept, the probable development of computers in the next ten years, and by laying the foundations of a cooperation in which each participant's role would be clearly defined.

Competition with the Japanese will not be limited to the materials that will be proposed during the next ten years; it is constant and equally covers the products which will be manufactured during the same time period. For the other countries, the only way to remain in the battle consists of formulating a competitive program. A task force composed of the great names in British computers, will study the problem and should offer its conclusions during the next three months.

The 'Cabled' Society

While awaiting the decisions that will be made in this area, the English plan to upgrade their telecommunications infrastructure, and to install in 1983 a new network composed of fiber optics. This should allow each household to receive a 60-channel communications cable.

The government points out that this is the greatest achievement since the railways, telephones, and electricity. Moreover, for electoral reasons, Mrs Thatcher would like to see this operation launched before next year's elections.

The issue has been studied by a consulting committee, whose report should be published in the coming months; it envisages a new market of several billion pounds, which would also generate an intensive economic activity.

The report seems to have been well received by the government, especially since the operation will not require public financing, it being clearly indicated that all the funds will be gathered from private sources. Decisions should be taken about this matter before next autumn.

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CSO: 3102/245

BRIEFS

FRG ENERGY R&D FUNDS--A research program in the field of energy for the 1982-85 period totaling 10.8 billion marks has been approved by the West German authorities. Advanced nuclear research (high-temperature and breeder reactors), as well as coal gasification and liquefaction are part of this program. Funds of DM 1.6 million have been allocated for gasification processes, DM 166 million in the 1982 budget; and DM 572 million for the study of coal liquefaction, 123 million of it in 1982. [Text] [Paris SEMAINE DE L'ENERGIE in French 6 Apr 82 p 10] 9969

FRG ENERGY RESEARCH BUDGET--Bonn--on 24 March the West German cabinet adopted a multiyear energy research program of 10.8 billion marks (4.7 billion dollars) for the 1982-1985 period. Coal gasification and liquefaction and advanced nuclear research figure among the broad directions of the program. Funds of DM 1.6 billion will be devoted to coal gasification during the 4 years in question, DM 166 million of which are in the 1982 budget. DM 572 million are planned for coal liquefaction--DM 123 million for this year. Bonn will devote DM 2.9 billion from 1982 to 1985 to the development of high-temperature and breeder reactors, of which amount DM 701 million are in this year's budget. [Text] [Paris AFP SCIENCES in French 25 Mar 82 p 7] 9969

MORE FUNDS FOR COAL CONVERSION--The highest growth rates in Bonn's outlay for energy research and development through 1985 will be in expenditures for coal conversion, especially coal gasification. This derives from the new energy research program that Federal Research Minister Andreas von Buelow, after numerous delays, is now presenting to the cabinet for ratification. The plan calls for an increase in research expenditures for coal gasification from DM 166 million in 1982 to 672 million in 1985; in comparison, the expenditures for coal liquefaction will only increase from DM 123 million to DM 163 million. The total annual allocations to be provided for coal conversion for 1982 through 1985 are respectively (in millions of DM) 289, 438, 604 and 835. The program proposal is reported to justify the relatively high investments on the basis of industrial and energy policy. Not least, it involves reducing dependence on imports and securing the international position which the FRG has established in this technology of the future. The Federal Government will presumably make its decisions in the second half of 1982 regarding further aid for large-scale coal liquefaction installations. The mechanism of awarding hydrogenation preferences for the operation of such facilities will be tested. At today's prices, the production of a liter of gasoline from German coal would cost about twice as much as a liter from petroleum; hence the necessity for a large subsidy. [Text] [Duesseldorf VDI NACHRICHTEN in German 16 Apr 82 p 42] 9160

ITALY EXHIBITS LATEST IN INDUSTRIAL ROBOTICS SYSTEMS

Paris INDUSTRIES & TECHNIQUES in French 20 Mar 82 pp 7, 10

[Article by Andre Larane: "Robotics: Italy Scores Some Points"]

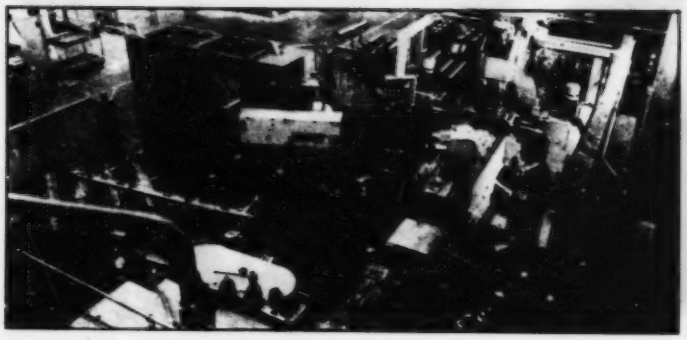
[Text] Machining Lines for Grenoble and Orleans. Twenty-eight Stations for Angouleme.

Robots were yesterday's news. The present belongs to flexible shops and automated production cells. At the Fifth NC Industrial Automation & Robot, the multitude of arms with one to six degrees of freedom testifies to the maturity of this sector, which affects painting, welding, and other areas.

With its assembly robot equipped with a Westinghouse camera, Olivetti is very representative of the current research, which is oriented toward fairly rapid shape recognition of jumbled parts. The demonstration of the Italian manufacturer is not convincing because it is restricted to flat objects and requires an 8-second delay for the camera to analyze a part. It goes without saying that the confidential work carried out in laboratories and large firms has gone beyond this stage. After buying 40 Olivetti robots for its own needs, Westinghouse itself is preparing some surprises. At the Polytechnic school of Milan, professors Rovetta and Somalvico are specializing in "seeing."

Doctor Daniele Fabrizi, president of Siri (Italian Company for Industrial Robotics), is astonished at the ferment in the sector. "Once dominated by large groups such as Fiat, robotics is today swarming with small enterprises such as DEA or Speroni, who originally were specialists in measuring machines." But he is very happy about the very rapid entry of his countrymen into the field.

Luciano Torri, technical director of Mandelli, presented the achievements of his company, which manufactures CNC machining centers in Piacenza: before the end of the year, it will inaugurate a machining line for four models of generators at Alsthom-Atlantique Unelec, in Orleans. It will consist of two machining centers with 1200 mm vertical clearance, as well as palletization and control devices (spindle effort and tool life). A multi-spindle lathe, a washing installation, and automatic part feeding will complement this equipment. The installation will be



Maintenance and deburring robot for body parts. Eight axes and an optional milling head. (Documents Jobs)

controlled by a central computer, and only a single operator will be required for supervision. The parts will be measured on the machining centers through statistical sampling, using Renishaw type sensors. An average machining time will be of the order of 20 minutes.

Flexible Machining Line

A second French plant to be equipped by Mandelli will be Caterpillar in Grenoble. It will receive a flexible line with five machining centers with an Over device for head rotation. Thanks to this system, designed in Italy, the spindle works horizontally or vertically, as needed; together with a rotating platform, it machines the five faces of a part.

For its most recent project, Mandelli will equip IBM-Italy in Vimercate, with its new Quasar machining centers. These compact machines with continuous palletization, are in fact designed by flexible shops.

Elsag (Elettronica San Giorgio), in Genoa, specializes exclusively in top of the line numerical control machines and flexible systems. After installing a line of eight machines at Nuova Innocenti, the company is preparing to place 28 stations under the control of a central computer at Leroy-Somer, in Angouleme. The stations, assigned to the fabrication of a very extensive line of engine parts, are already in place; they include machining, lathe, control, maintenance, and even heat treatment stations. A robot also services seven stations and handles parts up 90 kg in weight. The central computer will program the machining as a function of orders, supplies, and priorities. The anticipated result is a better utilization ratio, a reduction of parts in progress, and higher quality.

Among present achievements, are the Maserati plant in Modena, equipped by Olivetti with a line consisting of ten machining centers with automatic transfer. Comau, the Fiat machine-tool subsidiary, boasts of several installations in the automobile and heavy truck industries.

In the shadow of the large manufacturers, the smaller enterprises are consolidating their positions. Jobs, established in Piacenza, offers an eight-axis maintenance robot, to which is attached a small 18,000 rpm milling head. But since the prototype is in operation at a military firm in Varese, the visitors to the Milan exhibits will see only the company's conventional robots. Which leads us to regret that the current Italian and French manufacturers had very few innovations to show.

11,023
CSO: 3102/262

INDUSTRIAL TECHNOLOGY

HEAVY ALUMINUM SHEET METAL PLANT HIGHLY AUTOMATED

Paris INDUSTRIES & TECHNIQUES in French 20 Mar 82 pp 25-27

[Article by Jacques Houbart]

[Text] Foundry, rolling, quenching, quality control: all computer operated. Cegedur well deserves to be the second in the world.

The new equipment installed in the last few months by Cegedur-Pechiney at its Issoire plant, doubles the French production capability for aeronautical-specification heavy aluminum sheet. Thanks to its total investment of 100 million francs (in 13 months), the enterprise not only meets the needs of the Airbus and defense, but also those of several industrial sectors enticed by the quality of this new "precision industry."

Aluminum metallurgy has achieved a forward thrust for heavy sheet in the wake of the progress made by industrial computerization. Given the performances of numerical control machines, capable of rapidly and economically shaping thick sheets, designers have been able to abandon the dual system of sheet metal/stiffener for many components, and instead adopt "integral structures" for wing construction.

With the introduction of thick aeronautical sheet, machined parts compose both the outer skin and the internal support structure; the weight of the finished part generally represents 15-20 percent of the weight of the blank. This results in remarkably light, high performance parts.

This technologic evolution began very early in France, in the early 1960's, thanks to the inception of the Concorde program and to the delivery of rough blanks to Dassault for the construction of Mirage's integral structures. After 1975, this was followed by the beginning of the Airbus production, and then by the English-German-Italian plane, the Tornado. The acceptance of thick sheets from Issoire by Boeing took place in 1978.

In 1981, the new heavy sheet metal plant supplied up to 20,000 t/year. Its equipment handles products of much larger dimensions: the unit length went from 15 to 22 m, opening the market for new generation planes. The latest Cegedur investment includes a foundry unit equipped with the latest improvements for liquid metal treatment (melting, maintenance, and casting are entirely computer monitored and controlled); a second drawing bench of 60 meganewtons, in parallel with the

existing 50 meganewtons installation; an totally computerized quenching oven; an annealing oven; an ultrasonic quality control installation; and ancillary maintenance, sawing, and other facilities.

Precision metallurgy means first and foremost the perfect mastery of the the basic material, and the history of thick sheet-metal in France owes a large debt to the Voreppe Research Center which supports the Central Testing Laboratory of Issoire, using every opportunity for progress expected by aircraft manufacturers. Among the most recent developments are the 7050, 7010, and 7475 alloys, which guarantee high strength together with good mechanical characteristics. Special heat treatment processes applied to the 7000-alloy family improve their specifications.

Perfect mastery of stress, fatigue, and stress corrosion resistance while using the least amount of material possible (lower safety coefficient), demands an accurate knowledge of all aspects of the metal's properties. This imposes a rigorous control at all stages of the metal's formulation and processing, so as to achieve a homogeneous structure with perfectly defined characteristics.

Assuring Conformity with Standards: the Laboratory Breaks 500-600 Samples per Day

Batch composition must be perfectly monitored and reproducible when the alloy is formulated. After melting, when the aluminum and additive elements are mixed, all foreign bodies (gases, oxides) must be eliminated from the liquid bath. That is why the new foundry unit is equipped with the latest improvements in liquid metal treatment. At the time of casting (semi-continuous technique), the metal is again carefully filtered, with the various operations being monitored by computer. The casting is spectrographically analyzed to verify if the alloy composition conforms to the standard's definitions.

To achieve a homogeneous structure throughout the thickness of the plate (same structure at the surface as in the center), the metal is hot-rolled using a reversible mill with a table width of 3.40 m, driven by a 15,600 hp motor. Computerization assures remarkable conditions of planning, reliability, and speed. Milling temperature, which is extremely important in determining product quality, is monitored with particular care. At this point, each plate is assigned a number, like an original printer's edition. This identification makes it possible to trace its fabrication history, even at the application stage. During high precision heat treatments (plus or minus 2 degrees C), the plate temperature is monitored with thermocouples located at the hot and cold points of each quench.

To eliminate the internal stresses created by the quench, stresses which could cause deformations during the machining of parts, each plate is drawn on 5000 and 6100 ton benches, which places them among the highest performance equipment operating in the world. The residual elongation of each plate is then carefully measured. Automatic ultrasonic-immersion quality control installations--60 and 210 square-meter tanks for plates of 3200 x 22,000 mm--are then used to examine the internal soundness of the sheets; any existing defects are shown at one-tenth scale on a recording. Each automatically detected defect is next evaluated more precisely through manual control by comparing it with AECMA standard normalized defects. The entire thickness of the product is probed, except for two "dead zones" of 3 mm per face. In addition, a surface "conductivity" test (sygma-test) verifies the homogeneity of the quench.

In order to improve the mechanical properties of some alloys, increase their stress-corrosion resistance, or strengthen them, a hardening treatment (up to 45 h) is sometimes applied and is controlled with the same precision as the formulation of solutions. Before delivery, the mechanical pull characteristics of the products are measured to assure conformity with receiving inspection standards. The Issoire laboratory thus breaks 500-600 samples per day.

Surfacing is then necessary in order for the user of thick sheets to be able to perform high-precision NC machining. This consists in removing from each face, a layer of metal corresponding to the zone which was by-passed by the ultrasonic control, while operating within very close tolerances (5-20 hundredths mm). The task requires patience and minute attention. At Issoire there are only six technicians practicing this specialty, which falls midway between initial processing and the finished product.

Aeronautics metallurgy is stimulating other industrial sectors which require materials with higher performance. That is how for example, Fortal HR supplied in thick sheets (aluminum, zinc, magnesium, copper) is expanding the aluminum market. In some applications (such as stamping) it results in machining time savings of 50 percent.

Applications in Pressure Vessels, Naval and Railway Construction

In Limoges, at Legrand, world leader in the fabrication of electrical installation equipment, Fortal HR is used notably in stamping; but this product is suitable for bending equipment, some coining, and injection molds. Thick sheets from the aeronautic industry are also increasingly used for pressure vessels, or in naval and railway construction, for industrial vehicles, and in the weapons industry.

However, it is not impossible that in its original sector--aeronautics--thick aluminum sheets will have a second spurt despite the development of composites: it seems that the size race for cargo and passenger planes has already started. Boeing is studying the design of a twin-fuselage plane weighing 1600 tons, with a wingspan of 160 m, and powered by 12 turbojets. Its first application could be the transportation of liquefied natural gas from Alaska. Dornier is also studying a 1000 t plane, with a wingspan of 100 m, equipped with 10 turbojets and capable of transporting 400 t at 800 km/h. What is certain in any case, is that the battle for the skies in the year 2000 will be a battle in which aluminum will play its part, but will probably not risk its existence.

CAPTIONS

The 3.4-meter wide reversible rolling mill is driven by a 15,600 hp motor. The bold advance in thick sheets was made possible by the progress in industrial computers. Production is 20,000 t/year. (Documents Cegedur-Pechiney)

The vertical quenching oven. The temperature is controlled to plus or minus 2 degrees C.

Drawing bench with a power of 6000 tons. This traction is intended to eliminate the internal stresses due to quenching, which could cause deformations.

Hot and cold points are monitored by thermocouples before placement on the bench.

Ultrasonic quality control tanks. Some accommodate sheets of 3 m x 22 m. The automatic control is designed to detect internal defects following drawing.

Ultrasonic quality control: a recording shows possible defects.

Flatness verification of a surfaced sheet. The product quality is attractive to other industrial sectors which require high performance materials.

Conductivity measurement to verify quench homogeneity.

The plate is numbered. The history of its fabrication can be retraced.

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CSO: 3102/262

RENAULT PUTS FIRST FLEXIBLE WORKSHOP INTO OPERATION

Production Line

Paris LE MONDE in French 7 May 82 p 30

[Article by LE MONDE special correspondent Veronique Maurus]

> [Text] Boutheon--On Monday 3 May in Andrezieux-Boutheon (Loire), Labor Minister Jean Auroux inaugurated a flexible workshop for machining gearbox housings; according to the Renault group, this represents a French, and even a world, "first." In fact, the workshop covering an area of 3,000 square meters, is operated in real time by a computer which, being in constant contact with the machines, continuously provides for optimal production costs. It simultaneously handles the four pieces which make up the new B-19 gearbox now being supplied by Renault Industrial Vehicles [RVI]. This gearbox will be used in all of the group's topline vehicles, replacing the gearboxes hitherto purchased in part from foreign manufacturers. This workshop is being made a part of the RVI de Boutheon plant, which employs 570 wage earners and manufactures about 100 gearboxes per day.

The Boutheon plant is the usual type, modern without going to excess. It is a large machine shop with rough walls, under a light framework, not very well lighted or very clean, cluttered with tote boxes, cables, and pulley blocks. A few meters away, we have another world. New flooring, lighting, walls painted with frescoes; all this counts for a lot. But that is not all. With one step we have crossed the threshold of a century. No more plant, no more workshop; more a sort of mockup like an enormous toy, halfway between an erector set and an electric train.

Perched in a glass-lined cabin, insulated from noise and heat, man and computer control a group of discreet, well-dress automatons: seven machines[1], protected by a hood to prevent any spattering of water or oil, machine, drill, and bore out the pieces, each at its own rhythm, without human intervention. Eight dollies circulate among the machines, obviously self-propelled, guided by invisible wires whose network, one can guess, is

underground. The dollies bring the rough pieces to the entrance of the shop, transport them from work station to work station, and then, when the machining is completed, bring the finished piece to the end of the line. All that is done without noise, while respecting, traffic permitting, subtle rules of priority dictated by an electronic brain, and going so far as to change an old battery for a new one when the old one is used up. With their load, the dollies weigh 3 tons each; one would say they are "Lego."

Four different pieces--gearbox housings for very large vehicles--are machined in this workshop at the same time. The "intelligent" machines recognize the model and adapt their tools immediately. The computer controls everything: it distributes the workload among the various machines, alters their programs, arranges priorities and, in short, renders production costs optimal every moment. In case of a breakdown, it isolates the defective machine for the time necessary to make repairs, so that the work continues, more slowly but without stopping. When a new piece is introduced, 4 hours are sufficient to adapt the entire workshop (whereas, with the conventional system, at least 80 hours are needed to change a manufacturing line). No excess stock, no break in the rhythm, everything done is real time. Only two men in blue load and unload the dollies according to indications which the computer records on their printout. Ohters inspect, regulate, and repair as necessary; one scarcely sees them. There are a total of 15 persons in two shifts for a current daily production of 25 housings, 40 per day by the end of the year, 70 when the line is in full swing, and 100 forecast for 1985 (with 20 persons).

Designed and built by and for the Renault group[2], is the Boutheon flexible workshop really a "world first," a "true French flexible workshop first," as the company asserts?

An Event

It is surely the most sophisticated automated production system of the Hexagon, the only one to be operated in real time by a computer and to function in this manner in such an aggressive environment (projections are normally quite substantial). The first in the world? Let us not quibble. In any case, in the Renault group and in the small world of French robot operations, it is an event.

According to the director, this workshop represents for Renault Machine Tool [RMO], "the first tangible expression of a strategy" (see second article), a fabulous showcase and a laboratory of true grandeur. For RVI it has been at least a gamble for 2 1/2 years. Having "no alternative other than to raise itself to the highest level of international competition," according to M Zanotti, its president and general manager, in order to attempt the difficult recapture of a domestic market which had fallen to the 1965 level, and, if possible, to find new outlets abroad, RVI had to invest in new machining methods while being "sure that the technology chosen would still be valid in 2000." To manufacture the four types of housing at the required productivity level, the group had a choise, once the highly inefficient conventional machines were eliminated, between two alternatives: either to

install four different production lines equipped with sophisticated robots but designed to handle a particular type of piece, or to develop a single robotized production line capable of handling the four different pieces upon demand. The latter solution won out because of its flexibility, but not without reservations and misgivings. "I risked being without a gearbox," M Zanotti admitted, expressing relief.

Two and one-half years later, however, the gamble seems about to pay off. For a tie-up of funds equal to that of a conventional system[3]--savings realized on the stocking of parts would offset the excessive cost of equipment--the Boutheon workshop enables RVI at any moment not only to adapt its production to the demand, any adjustments for going from one reference to another being eliminated, but also, over the longer term, to modify the machined product without involving the tooling--that is, to introduce completely new pieces, the only condition being that they fit into a cube having 60 cm on each side.

Equivalent Number of Employees

As for the number of employees, that is another matter. In theory the flexible workshop permits an appreciable manpower savings (a single line instead of four). In fact, RVI asserts, the number of employees is the same as that of the strictly conventional system, due to the increased need for maintenance personnel. Moreover, the introduction of a flexible workshop requires increased skill among the workers, enriches their work, and improves the quality of the product by eliminating repetitive or irksome tasks. Under the circumstances, the establishment of the Boutheon plant has made it possible to create 15 jobs, 9 of which are highly skilled requiring a total of 10,000 hours of training, or an average of 4 full months per person. It should be pointed out that the machining time for one piece is reduced to 1 hour, compared with 6 in the conventional system.

Contested? Apparently not, or at least not yet. Stressing the "national importance of this accomplishment," the secretary (CGT [General Confederation of Labor]) of the RVI Central Committee for Enterprises, who was invited to the inauguration, rightly expressed regret that the workshop has not yet been presented to the shop personnel as a whole (570 employees), emphasizing the dangers of a rejection by nontrained workers compared with younger workers, and the mastering of new techniques. Also present, the minister of labor in turn did not hesitate to praise the merits of the intelligent machine: "Yes to the machine" and, to Renault: "You are showing the way." Alas! For, according to M Zanotti, although there is only one workshop of this type in France, there are already 9 in Sweden, 9 in the FRG, 25 in the United States, and 40 in Japan.

FOOTNOTES

1. Four machining centers, two convertible modular machines, interchangeable, and a boring and truing-up machine.

2. RMO designed and built the workshop; 65 percent of the equipment was supplied by the Renault group, specifically RVI, which manufactures all the gearboxes for its heavy vehicles at the Boutheon plant.

3. To manufacture its new gearbox, RVI plans to invest a total of 300 million francs at its Boutheon facility; 125 million have already been committed, and 45 million are just for the flexible workshop.

Market for Technology

Paris LE MONDE in French 7 May 82 p 30

[Article by R. C.]

[Text] For nearly 10 years, Renault has been developing an all-round strategy in the area of automation. Machine tools, robots, self-driven dollies, measuring machines, programmable automatons, inventiveness, basic and applied research, training by its subsidiary, RMO, the Regie [Renault state-owned works] "is clearly expressing its aspirations in this future domain." Contacts have already been made for the construction of flexible workshops of the Boutheon type with Messier-Hispano-Bugatti and Caterpillar.

Will the Regie profit from its presence in the American market to export this technology, as it has done in the case of robots, by establishing a subsidiary with the American-owned Ransburg (Cybotech)? The agreements with Mack and Dodge could help it in that respect. But Renault prefers to wait: "We are not contemplating getting going in the United States," an RMO executive comments. "Our agreements deal with products, not equipment. Moreover, this type of shop involves special machines [that are] very difficult to sell 6,000 km from our base of operations. For example, Japan exports mainly standard machines right out of the catalogue, not this kind of equipment." According to Renault, this type of workshop is adapted to small and medium production runs in the sector of mechanical construction (trucks, agricultural machinery) and electrical construction. Theoretically, it is also adapted to the PMI [small and medium-size industries]--particularly in its light version, the flexible unit. But few companies have the means to acquire such equipment, either from the financial standpoint or from that of the technical capability to master this advanced technology.

8568
CSO: 3102/266

SCIENCE POLICY

RESEARCH BILL APPROVED BY COUNCIL OF MINISTERS

Paris AFP SCIENCES in French 25 Mar 82 p 7

[Article: "Policies and Organization of Scientific Research"]

[Text] Paris--An official communique published after the Council of Ministers meeting on 31 March announces that the Minister of State for Scientific Research and Technology has presented a bill for the orientation and planning of technological research and development in France, prepared after broad consultation with researchers, unions, and economic leaders, and after having been submitted for review by the Economic and Social Council.

"The major objective of the bill, which includes the text of a law and an appended report that is also submitted for parliamentary approval, is to bring expenditures for internal research and development to 2.5 percent of the GNP in 1985. This effort will take the specific form of multiyear mobilization programs on themes of national interest associating multiple partners."

"The law provides that the legal status for research personnel may depart from the general status for government employees in order to allow the recruitment of experienced French or foreign researchers or engineers, to improve the methods for evaluating qualifications, and to facilitate the free movement of men and teams among [public] organizations, firms, specifically public ones, and establishments of higher education."

"A new category of public establishments of a scientific and technical nature will be created. Public interest groups with a specified duration will constitute a powerful and original means of achieving actions associating various public and private partners. The regional dimension of research will be taken into account."

The Ministry of Scientific Research emphasizes that while the bill itself defines, in 26 articles, the provisions of a legislative nature, the appended report "describes policy" and the broad programs projected, and constitutes "a document which has the force of a plan."

It is estimated by the ministry that the bill and the appended report should go to Parliament during the first half of May.

9969
CSO: 3102/264

SCIENCE POLICY

FRENCH CIVIL R&D BUDGET TO INCREASE DRASTICALLY

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
14 May 82 p 7

[Article: "France Beefs-Up Research Support: Space Technology an Area of Emphasis"]

[Text] Frankfurt, 13 May--Expenditures by the French Government for civil research will be drastically increased in 1982 in line with the thinking of the new government. Compared to 1981 figures, expenditures will be increased by 29 percent to F 25.4 billion. Three-fourths of the budget--F 20 billion--goes to the research ministry; the remaining funds will be distributed to various other ministries. A specific outcome of this is the creation of 1,580 new positions for scientists and engineers this year. In addition to financing current budgets for research institutions, the research ministry will administer nine research programs which together will spend F 9.1 billion. The budgets for the main categories in millions of French francs are:

Nuclear research program	3,395.0
Space technology	1,746.0
Sea technology	60.0
Solar energy	100.0
Anvar (risk capital business and innovation support)	827.3
General innovation support	90.0
Information theory	167.5
Data processing, communications	658.3
Aeronautical research and engineering	2,080.0

In the area of nuclear research and engineering, the light-water reactor continues to be the center of interest, especially with respect to safety research and uranium enrichment. In space applications, the most important

program is the Ariane booster rocket which is being developed under French program management. In supporting innovation, the French Government operates through the government corporation Anvar which shares the risk of worthy programs and also gives concrete aid in specific cases involving the application of research results. A specific item is aeronautical research support which currently includes the Airbus A 320 program and other aircraft developments.

In addition to these programs which total F 9.1 billion, there is still the support of institutions--handled the same as in Germany--which will require F 12.73 billion. Primary institutions in this category are the CNRS and the French Atomic Energy Agency. If the F 3.2 billion expenditure for institutional support of French atomic research administered by the Atomic Energy Agency is added to the line-item program allocations of F 3.4 billion, then the French Government will expend about F 6.6 billion for nuclear research and engineering in 1982. A categorical comparison with German institutional funding is not possible since the scope of activities of the individual institutions is quite different.

9160
CSO: 3102/292

EUROPEAN AIRCRAFT INDUSTRY IS BASED ON COOPERATIVE NETWORK

Duesseldorf VDI NACHRICHTEN in German 16 Apr 82 pp 26-27

[Article by Erhard Heckmann: "Programs Bind the Enterprises — The Aviation Industry Is A Network of Cooperation"]

[Text] The British aviation industry was the only one still intact in Western Europe after 1945. All other countries had to rebuild their aircraft industries. To this end they sought experienced foreign partners. In the beginning the United States was the partner with licenses and new technology but the cooperating Europeans have strongly caught up and become competitors (see also "The European Aviation Industry" in VDI NACHRICHTEN Nr 10/82).

Until the end of World War II aviation industry cooperation was limited to simple license contracts but genuine cooperation of the most varied form developed in the postwar period. There were several reasons for this. Only the British aviation industry among the western European countries survived the end of the war intact. The other industrial nations had to completely rebuild their aircraft industries. Another reason was that the products themselves, the aircraft, became technically far more demanding. Because of jet engines, aircraft could achieve higher speed ranges and became considerably more reliable and capable because of new types of navigation equipment, new aircraft control technologies, new means of construction and greater capacities. Transport capacity increased enormously. Thus a Boeing 707 or Douglas DC-8 surpassed the capacity in transport of the largest and fastest passenger ship. The influence of the equipment industry increased on both performance and construction costs. In short, aircraft also became more expensive — according to a Boeing formula, 7 percent per year due to new technology alone. This also increased the risk for the manufacturer. For this reason the attempt was made to shift the technical [risk], and thereby the economic, to several partners through cooperation. The same applied to the military sector. The Messerschmitt Me109 cost only 135,000 Reich marks [but] the Starfighter ran to DM 6 million and the Tornado about 30 million. Another reason for cooperation is found in offset agreements under the principle "if my company/air force is to buy your aircraft, you must give corresponding orders to my industry so that my plants can learn the new production technologies and also to preserve my currency reserves." This method is used today to sell not only Boeings and Airbuses but also Mirages, F-16s, F-18s and, not least of all, the NATO AWACS early warning system.

This brings one to a basic economic problem. The industrial state may be defined as one whose industry is technically capable of meeting domestic and export requirements in all areas. Strictly speaking, this would mean that only the two world powers are genuine industrial states. We cannot build aircraft carriers or nuclear submarines in Germany. The rule is thus somewhat bent. But Switzerland stopped domestic development of combat aircraft at the end of the 1950's and virtually the same applies to Canada.

Since the aviation industry is viewed as a pioneer industry which radiates technical impulses to the rest of the economy and helps it to raise the level of technology, a waiver here — often dictated by economics — also means decoupling from new technologies. But these new technologies are the result of extreme requirements and the developments proceeding from them. So as to at least not sever the connection to modern production technology, since today's production is yesterday's development, a transfer of this know-how is demanded.

Whereas in the case of military aircraft the customer, that is, the government, always paid for development and production, civil aircraft were formerly financed by industry. It was a matter of course that industry formerly could not pay for new developments from its back orders since it functions, just like the rest of the industrial economy, with bank credits. Only where the technical and business risk was unacceptable to industry did the state assist with lost subsidies, conditionally repayable loans, sureties and sales assistance. But the capabilities of individual countries are limited by their budgets. International cooperation or international work sharing offered a solution since the parliaments, which had to approve the necessary funds, gave international cooperation an almost moral value. In such cases industrial cooperation contracts are backed up by parallel governmental treaties. Such forms of cooperation are not limited to aircraft but also apply to engines and important equipment systems.

It is characteristic that these international connections range extensively through the firms. There are virtually no competitive situations between the enterprises. Competition is limited to subsectors although, as in real life, there are also enterprises which feel themselves to be more closely connected than others.

Genuine international division of labor developed first in the postwar years and is still in a state of flux. It began with the cooperation of German and French and French and British firms and has now reached worldwide proportions. It includes both the Japanese and the young Indonesian aircraft industry. It ranges from Argentina to Sweden.

The forms of international cooperation differ. The division of labor in development cooperation corresponds to the depth of financial [involvement]. Joint development teams can be used but also separate ones when the sectors can be clearly separated. Examples here are the Tornado, Airbus, Alpha Jet. In the subsequent production each state will emphasize its own final assembly because this facilitates experience feedback in the operational phase. In the case of Airbus, a single final assembly was selected for cost reasons since the price plays a prominent role in a civil project.

Many Forms Support Cooperation

In coproduction the development firm has already produced the production documents and possibly even already produced. In another part of the world a production consortium with clearly defined construction division and one or more final assembly lines is formed. The F-16 is an example.

License production is pure copying with the licenser initially furnishing the licensee knock-down sets which are disassembled aircraft consisting of a few main components. These are then assembled, checked and test flown with the [licensee] gradually assuming a greater depth of production. Examples: F-5E/F production in Switzerland and Bo 105 production by Nurtanio in Indonesia.

A further form is compensation to, as the capabilities of the receiving country allow, as far as a balance of payments with the deliveries being in part in foodstuffs (Romania) or in part in industrial goods. The not least important reason for cooperation agreements is also the availability of free capacities. This applies in particular to capital-intensive areas of tension.

License production was the foundation for the rebuilding of the German aviation industry after the war. If the initial NASH list of equipment is ignored, the so-called first generation of aircraft included the license construction by Focke-Wulf of the Piaggio 149 as a training aircraft, the Nord Aviation Noratlas [built] by the Nordgruppe Weser-Flugzeugbau and Hamburger Flugzeugbau, the Fouga Magister [built] by Flugzeug-Union-Sued. In F-104G Starfighter production the bilateral license agreements were replaced by a multination license consortium in which the aviation industries of Germany, Italy, Belgium and Holland were represented. This was quickly followed by the Transall program with Aerospatiale, VFW and MBB (HFB) and the Atlantic with Dassault Breguet and Dornier. Construction programs in which at least three NATO members participated were designated NATO programs. It is of advantage to the licensee when he receives the status of a development custodian during the use phase. He then assumes design responsibility for changes and improvements.

The next — and a higher — form of cooperation is joint development such as with the Tornado and Alpha Jet. Very differing organizational forms are used in the management of joint development and construction programs. They range from a working group to institutionalized forms. A few should be mentioned here.

Sepecat was established by Dassault and the British Aircraft Corporation (now British Aerospace) for development and construction of the Jaguar combat aircraft. The Airbus Industrie is a "Groupement d'Interet Economique" under French law with the participants being Aerospatiale (37.9 percent), Deutsche Airbus (37.9 percent), British Aerospace (20 percent) and the Spanish Casa (4.2 percent). Panavia GmbH with shares held by British Aerospace (42.5 percent), MBB (42.5 percent) and Aeritalia (15 percent) is registered in Munich under German law. The Turbo-Union Ltd for development and construction of the Tornado RB.199 engine is registered in England. Its shareholders are Rolls-Royce (40 percent), MTU (40 percent) and Fiat Aviazone (20 percent). The firms of Aerospatiale, MBB and VFW belong to the Transall Working Group.

CFM International SA to develop a 10-ton engine is held equally by General Electric and Snecma, the [project goal] having been achieved with the CFM56. Rolls-Royce Turbomeca Limited to develop and produce the Ardour engine for the Jaguar fighter-bomber is registered in London.

The following list will show how and with which programs the individual firms are interconnected.

/Federal Republic of Germany/. Dornier. Alpha Jet close air support aircraft: development and production jointly with Dassault Breguet, components production by Sabca in Belgium, license production by AIO in Egypt. AWACS early warning aircraft: subcontractor to Boeing for mission electronics integration. IA-63 light fighter: advise and support to the Argentine FMA.

MBB. Tornado multirole combat aircraft: joint development and production within the Panavia framework together with British Aerospace and Aeritalia. Transall transport aircraft: production of a new lot together with VFW and Aerospatiale for the French and Indonesian air forces. Airbus A-300 and A-310 passenger aircraft: development and production participation under an Airbus Industrie contract jointly with Aerospatiale, British Aerospace, VFW and Casa. F-28 passenger aircraft: parts production for Fokker. Bo 105 helicopter: joint production with Casa for the Spanish Bo 105, license production at Nuritano in Indonesia.

VFW-MBB. BK 117 helicopter: joint development with Kawasaki. Tornado multirole combat aircraft: participation in construction of fuselage center section. Transall transport aircraft: components production. Airbus A-300 passenger aircraft: participation in construction, reequipping to cargo version, share in A-310 production. F-27 passenger aircraft: components production for Fokker.

MTU. RB.199 (Tornado engine): development and production within the Turbo-Union framework together with Rolls-Royce and Fiat (MTU share: 40 percent). Tyne turboprop: joint production of a new series of 150 engines together with Rolls-Royce, Snecma and FN (MTU share: 28 percent). Larzac (Alpha Jet engine): production under KHD subcontract together with Turbomeca and Snecma (MTU share: 25 percent). Pratt & Whitney 2037: joint development with Pratt & Whitney and Fiat (MTU share: 11.2 percent). MTM 385 helicopter turbine: joint development with Turbomeca (MTU share: 50 percent). Allison 250: license production for Bo 105 helicopter (MTU share: 40 percent). General Electric CF6: production of high pressure turbine for Airbus engines together with Snecma and GE (MTU share: 10 percent). Pratt & Whitney JT8D: license production of turbine parts.

/Belgium/. Sabca. F-16 tactical fighter: final assembly and test flying of aircraft for Denmark and Belgium, coproduction with Sonaca, General Dynamics, Fokker and others. Alpha Jet: production of forward fuselage sections for Dornier and Dassault Breguet. Mirage F1 fighter: production of vertical and horizontal tail assemblies. Boeing 737: furnishing hydraulic final control elements.

Sonaca. F-16: airframe assembly and components manufacture for European-American coproduction. Mirage fighter: components manufacture. Lockheed C-141 transport: manufacture of fuselage skin components. Aerospatiale helicopter: manufacture of airframe components.

FN. F-16 F100 engine: production under U.S. Air Force contract. Tyne: license manufacture for new series together with Rolls-Royce, Snecma and MTU. CFM-56: development production. Larzac: components manufacture.

/Great Britain/. BAe. Harrier vertical takeoff aircraft: licensed to McDonnel Douglas in the United States, further development to AV-8B by MDD with BAe as subcontractor. Hawk trainer: development and manufacture, license assembly by Valmet in Finland, further development of Hawk to Navy trainer by McDonnel Douglas in the United States. Jaguar fighter-bomber: development and production together with Dassault Breguet within the Sepecat framework. Tornado multirole combat aircraft: development and production together with MBB and Aeritalia, development of air defense version. BAC 111: license manufacture in Romania. Airbus A-300 passenger aircraft: manufacture of wings, A-310 wing design, member of Airbus Industrie. BAe 146 feeder aircraft: development and manufacture, components manufacture by Shorts, Saab and AVCO (wings) in the United States.

Shorts: components manufacture for BAe 146, F-28 and Boeing 757.

Westland. Gazelle helicopter: joint British-French program from 1967/68, managed by Aerospatiale. Puma helicopter: same as with Gazelle. Lynx helicopter: derived from British-French program, managed by Westland. SH-3 Sea King helicopter for navy: further development of Sikorsky (S-61) license. EH-101: joint development with Augusta of Sea King followon.

Rolls-Royce. RB.199: development and production in Turbo-Union framework together with MTU and Fiat. Gnome: license manufacture and further development of General Electric T58. Adour: development and production of this Jaguar and Hawk engine together with Turbomeca. Pegasus: further development and production, planned license production in United States by Allison. Spey: development and production, American license production by Allison, planned license manufacture by Fiat for AMX. Viper: license production in Yugoslavia. Tyne: license production by MTU, Snecma, Fiat. GEM helicopter engines: RJ500 components manufacture by Turbomeca, joint development with Japanese firms IHI, KHI and MHI.

/France/. Aerospatiale. Mirage: components manufacture for Dassault Breguet. Airbus A300: development and manufacture within Airbus Industrie framework, final assembly in Toulouse. Airbus 310: development and manufacture within Airbus Industrie framework, final assembly in Toulouse. Airbus 320: development and manufacture within Airbus Industrie framework, final assembly very likely to be in Toulouse. Transall: prime contractor for new lot, manufacture jointly with MBB. ATR-42: joint development with Aeritalia. Gazelle helicopter: joint program with Westland, managed by Aerospatiale. Puma helicopter: joint program with Westland, managed by Aerospatiale, license production in Indonesia. Lynx helicopter: joint program with Westland, managed by Westland.

Dassault. Alpha Jet: development and manufacture jointly with Dornier, license production in Egypt by A.I.O. Jaguar: development and manufacture with British Aerospace in Sepecat framework. Mirage: development and production, components manufacture by Sabca, Sonaca, Aerospatiale and Casa. F-27: components manufacture for Fokker.

Snecma. Larzac 04 Alpha Jet engine: production jointly with Turbomeca, KHD and MTU. General Electric CF6-50, CF6-80A1 and CF6-80C: manufacturing participation together with MTU. Rolls-Royce Tyne: manufacture of new lot for Transall together with Rolls-Royce, MTU and FN.

CFM: joint General Electric and Snecma subsidiary to develop and produce the CFM56 10-ton engine.

/Italy/. Aeritalia. Tornado: development and production in Panavia framework together with MBB and British Aerospace, production of wings. G.222 transport aircraft: development and manufacture, components manufacture by HAI in Greece. AMX combat aircraft: development together with Aermacchi and Embraer in Brazil (30 percent). ATR-42 feeder aircraft: development together with Aerospatiale. Boeing 767: participation at own financial risk, production ailerons. Components manufacture for McDonnel Douglas DC-9-80, DC-10, Boeing 747SP and 727.

Aermacchi. AMX combat aircraft: development jointly with Aeritalia and Embraer. Boeing 767: participation in development. MB.326 trainer: license production in South Africa and Brazil (Embraer).

Augusta. Sikorsky S-61: license production following termination of production in the United States. Bell helicopters: license production of 204, 205, 206, 212, 412. Hughes helicopters: license production of types 300 and 500. Boeing-Vertol Chinook: license production. EH-101: joint development of Sea King followon with Westland in framework of European Helicopter Industries.

/Holland/. Fokker. F-16 combat aircraft: European coproduction, final assembly. F-27 Friendship: development and production, components manufacture by MBB, Sabca and Dassault. F-28 Fellowship: development and production, components manufacture by MBB and Shorts. Airbus A-300 and A-310: components manufacture. MDF-100 passenger aircraft: development jointly with McDonnel Douglas.

/Sweden/. Saab. 340 feeder aircraft: development with 30 percent participation by Fairchild (United States). BAe 146 feeder aircraft: components manufacture at own risk. McDonnel Douglas DC-9-80 passenger aircraft: components manufacture.

Volvo. Pratt & Whitney JT8D: further development and afterburner development to RM8A and RM8B. TFE1042: development based on Garrett TFE731. General Electric 404: 40 percent license production planned.

/Switzerland/. Emmen Aircraft Plant: final assembly of F-5E/F with deliveries from Pilatus and FWA.

/Spain/. Casa. Airbus A-300: components manufacture. Airbus A-310: development participation as partner in Airbus Industrie. Mirage: components manufacture. 212 Aviocar small transport: license production by Nurtanio in Indonesia. CN 235 small transport: joint development with Nurtanio.

It must also be noted that financial interconnections exist between several aviation firms. Dassault and Fokker are the owners of the Belgian Sabca which holds 4.9 percent of Sonaca. Northrop has shares in the Dutch firm of Fokker. This American enterprise also owns part of Casa, the other foreign shareholder of which is MBB.

8373
CSO: 3102/288

DIESEL ENGINE FOR PEUGEOT VERA EXHIBITED AT GENEVA

Paris INDUSTRIES & TECHNIQUES in French 20 Mar 82 p 10

[Article by JLT]

[Text] Starring at the Geneva Salon, the Peugeot Vera Supercharged Diesel

A new stage for Peugeot in the economy race: after Vera, the result of its materials research, the company has concentrated its efforts on engines, and at the Geneva Salon presented the prototype Vera 02 Diesel.

The agreement with the Agency for Energy Savings covered the development of a specific diesel engine, in keeping with the philosophy of a gasoline prototype. The results are remarkable: 3.5 l per 100 km at 90 km/h, 5 l at 120 km/h, and 5.2 l in city driving. Its performance is equally as good: 35.3 s for 1000 m from a standing start, and a top speed of 158 km/h. To achieve these figures, the basic engine selected by Peugeot has been the 1360 cubic-cm XY gas model which is used in the 104 and the Samba. It is supercharged to obtain sufficient power and torque.

Aluminum Alloy Pistons

Its various components are: aluminum alloy block and head, the former with cast iron insert sleeves, the latter with eight in-line valves with overhead cam; and a turbulence pre-chamber of the Ricardo Comet V type. To withstand combustion pressures of 120 bar, the special pistons are made of aluminum alloy with cast iron inserts, the connecting rods of nitrided forged steel, and the crankshaft of forged steel with damper pulley. The Bosch injection pump is equipped with a flow corrector controlled by the supercharge pressure. The latter is provided by a small KKK turbocompressor, specially designed to maintain acceptable pressures throughout the engine's operating range. Moreover, the poor efficiency of the turbocompressor at low engine speeds is compensated by an advance in the closing of the intake valve, and by the adoption of a 21.8 volumetric ratio. In terms of specific consumptions, the best efficiency range (185-195 g/hp.h) corresponds to normal utilization engine speeds.

The installation of a diesel engine has required several modifications of the vehicle. Sound and vibration insulation were enhanced by lining the hood and the plastic floorboard, by screening in the engine compartment, by a swivel joint on the turbocompressor exhaust, and by a torsion flap on the intake manifold to reduce the denture-rattle at idling. Lightweight equipment such as a cadmium-nickel battery were selected to compensate for the additional weight inherent in diesel engines. The diesel version is 53 kg heavier than the Vera.

"The approaches selected for the Vera 02 Diesel are all the more interesting for being appropriate for industrial production," as Peugeot points out. In fact, with the flat windscreen hubcaps and the sealed windows and headlights, the research spinoffs are already affecting the current models. On the new 505 station wagon, a 2 mm overhang on the rear of the roof causes a slight airstream break and improves aerodynamics.

And what is Renault doing in the meantime? It currently remains very discreet about the Eve Plus program, which focuses on three goals: an electronically-controlled automatic transmission with five distinct ratios, an energy-recovery device for the brake system, and most importantly, a direct-injection diesel engine.

11,023
CSO: 3102/263

METHANOL ENGINE UNDER DEVELOPMENT IN FRANCE

Paris INDUSTRIES & TECHNIQUES in French 20 Mar 82 pp 100-101

[Article by A.-M. Despradelles]

[Text] Descended from earlier motorcycle competitions, this methanol engine is powerful, responsive, and reliable.

The search for the miracle fuel that would replace gasoline or diesel fuel for thermal engines, is a challenge which has spawned many inventions since 1973. Some of them--remember the water-powered engine--have known a passing moment of glory thanks to the media, but very few have succeeded in reaching the industrial production stage.

Yet that is the case of the Moteurgaro, being built today by the Chenesseau company in Orleans. The first thing in its favor is the choice of methanol, which is known to have the best chances of becoming the fuel of the future, and which is the object of many research programs throughout the world. The second, is an inventor who can draw on some 30 years of experiments and tests.

Roger Agache, mechanical engineer, in fact won the Bol d'Or motorcycle competition on several occasions during the 1950's, and at the time had perfected a four-cycle engine with an in-head rotary distributor instead of valves. Moreover, he also won the "free fuel" races, having already opted for methanol, which gave him the decisive advantage of a better thermal yield.

The Suez events of 1956 encouraged him in his research, and the oil crisis of 1973 confirmed his belief that he had chosen the right path. He pulled out his files, and renewed his contacts, particularly with PCUK in Villiers-Saint-Paul, which promised to supply him, at no cost, with all the methanol that he might need for his tests. In 1974 he filed a patent application, and in 1975 two modified cars were burning methanol. One of them has already accumulated 110,000 km.

The decisive year for Roger Agache was 1980. In March, a manufacturer of automobile accessories and industrial supplies, the Chenesseau company, joined him in his adventure thanks to the intervention of ANVAR (National Agency for Implementation of Research)-Centre. The first prototype was in operation five months later. One year

after that, the endurance tests of the pre-production engine confirmed the validity of the option that they adopted: build an engine specifically designed for alcohol consumption, rather than adapt an existing conventional or diesel engine, an approach which has always resulted in problems.

The originality of the Moteurgaro lies in its high-pressure injection during the compression cycle, which encourages internal mixing, and in its combustion chamber, whose geometry assures charge blending and centrifugation leading to stratification and concentration in the ignition zone. Combustion can thus take place despite the overall leanness of the mixture. The only drawback of the design is a high exhaust noise resulting from an unusual effective average pressure, which has required the development of an adapted muffler.

The measurements made during 1981 showed very positive performance results. Torque and power are higher than the best known figures: 13.5 hp per liter of cylinder volume and per 1000 rpm, a value which is reached only by turbocharged engines. The torque remains constant from 1000 to 2400 rpm, and the power is 33-49 percent higher than that of a diesel engine with the same cylinder capacity. Moreover, the maximum temperature remains below the usual levels, thus doubling the lifetime of the oil. A clean fuel, methanol produces very little nitrogen oxides and CO, and does not corrode engine parts. And finally, the combustion acceleration is such that ignition advance with cold spark plugs can be set at a very low value, constant for all engine speeds.

The first application will be on a light tractor for rice cultivation in tropical areas, to replace a conventional 67-75 hp diesel. Particular attention was devoted to power control, so as to respond to all utilization conditions. A pressurized tank and modified fuel supply system avoid the evaporation and vapor lock phenomena that are unavoidable in that climate. Ignition is provided by a magneto for simplicity and reliability. This engine also appears as an ideal solution for emerging nations that are not oil producers, but whose vegetal resources permit local production of methanol. And eventually, it might also become interesting to industrialized nations.

11,023
CSO: 3102/263

BRIEFS

'WREN SKYSHIPS' FOUNDED--A new company, Wren Skyships was founded in London on 31 March to build a new type of rigid dirigible with an aluminum shell, which could carry a useful load of 18 tons at speeds of 135 knots (about 220 km/h). Its founder is Major Malcom Wren, an engineer who several years ago had created another enterprise, Airship Industries, to reinstate dirigibles as a means of transportation. Last year, Airship Industries produced its first soft skin prototype, the Skyship 500, which should be followed by commercial versions; and the Walloon Regional Society for Investments decided 15 days ago to join it, aiming at the transfer of some of the company's production units to Wallonia. However, Major Wren has decided to separate himself from Airship Industries in order to concentrate on the new type of airship. According to him, the pressurized rigid shell will allow much higher speeds than conventional soft skins. It will also be possible to equip it with jet deflectors which will facilitate maneuvers at lower speeds, and utilization will be possible in all weathers. He added that negotiations are under way for financing the project, including the outfitting of a manufacturing shop in North America. [Text] [Paris AFP SCIENCES in French 1 Apr 82 p 46] 11,023

LONGER-RANGE A310 PLANNED--As part of a continuing product improvement program, Airbus Industrie plans the development of the A310-300, an A310 version with longer range and increased takeoff weight. The maximum permissible takeoff weight of the A310-300 will be 149 tons as compared with 132 or 138.5 tons (option) for the A310-200. The range with 218 passengers is 7,135 kilometers with the normal fuel reserves (more than 8.5 flying hours) whereas the A310-200 has a range of 5,000 kilometers (5,930 kilometers for the 138.6-ton option). The company considers that the A310-300 is the ideal aircraft to [replace] the classic four-jet older generation aircraft on medium and long routes. Among other things, the A310-300 offers a fuel saving of up to 40 percent per seat. [Text] [Duesseldorf VDI NACHRICHTEN in German 9 Apr 82 p 20] 8373

SKF AIRCRAFT CERAMICS, COMPOSITES--Would you feel safer at an altitude of 10,000 meters if you knew that the balls in the aircraft engine's bearings were made of ceramic and that the rods actuating the control surfaces were made of plastic? However you might feel, that development is underway. The Swedish Ballbearing Works (SKF) is at work in its laboratories to produce balls of silicon nitride--a ceramic material that is compressed and heated together (sintered) from powder. The advantage of the new balls is that they would be 60 percent lighter than steel balls, that friction--and thus heat generation--would be lower, and that ceramic is harder than steel. It does seem that ceramic would be brittle, but the SKF says that the balls could not crack under any circumstances. As in the case of steel balls, the wear would occur on the surface. In addition, ceramic balls would withstand the high temperatures in aircraft engines better than steel. The same firm is also working in France to produce parts of the frame structure constituting the fuselage of an airplane or helicopter out of carbon fiber-reinforced plastic. It wants to use the same material in the push-rods used by the pilot to control the movements of the aircraft's various flaps. In this case, a reduction in weight is the main goal, but militarily, there is another advantage: a shot fired through a carbon fiber rod leaves only a hole, and the rod is not ruined. [Text] [Stockholm SVENSKA DAGBLADET in Swedish 12 May 82 p 14] 11798

CSO: 3102/294 END

JPRS 81292

16 July 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 111

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JPRS 81292

16 July 1982

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SCIENCE AND TECHNOLOGY

No. 111

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BRIEFS

FRENCH BIOTECHNOLOGY FUNDS--In 1983 the French Research Ministry will allocate 250 million francs for research in biotechnology. In 1981 it invested 30 million francs in this field. State support for various research programs, along with research at state institutes and at private companies, will amount to a total French investment in biotechnology of 1 billion francs next year. [Text] [Stockholm NY TEKNIK in Swedish 20 May 82 p 17] 9336

CSO: 3102/351

GOVERNMENT DECISIONS ON RESTRUCTURING OF CHEMICAL INDUSTRY

Paris CHIMIE ACTUALITES in French 28 May 82 pp 2,3

[Text of Industry Minister Pierre Dreyfus' press release on his plan to restructure France's chemical industry]

[Text] In its substance as well as its form, the "rationale" released in exegesis of the decisions taken in the 12 May cabinet meeting, and handed to the press the following day by the Minister for Industry, merits publication in extenso.

As we reported on the front page of our previous issue, the message that emerges from this text indicates that the idea from now on will be for government to be more energetic than particular about minor details.

Even though it ranks fourth worldwide in its volume of production, the French heavy chemical industry is a sick industry. After 20 years of hesitation, of strategic tergiversation, and of mergers that failed because they were not undertaken as part of any overall plan, it is beset today with a sea of troubles comparable to those the steel industry is suffering, and this is happening in spite of the skill and dedication of the men who have whole-heartedly worked to make it grow.

In 1981, the six state-owned companies in the sector (Rhône-Poulenc, CdF-Chimie, ATO, and Chloe -- subsidiaries of ELF-Aquitaine and CFP, PCUK, and EMC [Entreprise Minière et Chimique] (most of whose chemicals activity is conducted outside France), to which we should add Cofaz, a subsidiary of Paribas, and the chemical holdings of Elf-Aquitaine and SNPE [National Powder and Explosives Company] -- have lost 4 billion francs. State-owned chemical companies, with a volume of business of 80 billion francs and more than 110,000 people on their payrolls, account for almost half of the sector's potential, and for most of the basic chemicals industry.

It was high time, therefore, to take the necessary action to remedy the situation, unless we were willing to accept a debacle that would have had horrendous impact on the economic and social levels. This is why we suggested to the cabinet yesterday that we regroup our efforts around three major objectives.

Why This Situation?

The French chemical industry was headed for ruin, for a number of reasons:

1. Like all its European competitors, our heavy chemical industry failed to anticipate the halt in growth in the wake of the oil price hikes; today it is laboring under the burden of considerable excess capacity, which gives rise to a drastic decline in prices and to a suicidal and fratricidal war among producers.

2. The French chemical industry is heavily dependent on foreign suppliers for raw materials, and hence has been hot by costs in excess of those of come of its competitors who are vertically integrated or who have access to cheaper resources.

3. Our conventional chemical industry is not getting adequate backup from value added by refined chemical products and by technical and marketing know-how: the French chemical industry makes products requiring less processing than those of its German or American competitors, and handles its marketing activities less expertly.

4. The industry as a whole has only a fair-to-middling productivity record, both because its main plants do not have facilities for processing on the requisite scale, and because they are so widely scattered that their transport costs are prohibitively high, and they fail to promote the r products properly.

5. French-owned plants are concentrated here, though the competition is European, if not world-wide, due to the lack of facilities that would enable them to extend their competition into other markets, and consequently our chemical industry is falling back to a defensive position.

6. Lastly, the state-owned chemical industry is in dire financial straits as a result of the accumulation, over a period of years, of low returns and of rising indebtedness.

Nationalization of these companies makes it possible to remove the built-in obstacles to rescuing our heavy chemicals industry and pulling it out of its morass of debt with the state doing its duty as shareholder; nationalization also opens the door to better long-run deployment of such trump cards as exapnsion of the refined chemicals sector.

In order to rebuild the foundations for a dynamic chemical sector, our action will consist of laying down some clear-cut guidelines as to the goals to be aimed at and the restructuring to be undertaken, leaving it to industry leaders to spell out the contours and pace of the process.

Sector-wide inertia has now reached a point where any reorganization must first be designed in a long-term optimum perspective, prior to defining, on the basis of what we have now, the practical steps most likely to match the ideal design. Both interim and final structures must, further, encourage consistency in investment decisions, whether at the national or the corporate level.

This is going to be a tough job, and history has shown us just how hard. Reason, however, commands that we move forward and this last chance for the chemical industry to profit by the expansion of the public sector must be taken full advantage of. This remodeling process must be based on several principles:

* In heavy chemicals, the first thing to be done is to make our plant competitive again, while concentrating our investments in modernization on the few plants we have that are big enough to be properly balanced and well placed in relation to their raw materials supplies and to the market. We must also absorb our excess capacity, working with other European producers. Lastly, we must move to consolidate our raw materials supplies and to nurture, especially in the chloridation sector, France's competitive edge deriving from its nuclear power program.

* Even while this streamlining in the upstream portion of heavy chemicals goes on, we must develop new downstream activities in advanced chemicals, both to win back our markets and to provide the necessary job replacements.

We have therefore devised six major lines of action:

1. For petrochemicals, a return to the best industrial plant sites France has to offer is deemed indispensable.

The commanding position of Ato-Chloé and CdF Chimie (70 percent of the market) lays a very special responsibility on these two partners. They will be asked to draft a program of concerted raionalization, since the competitition constraint prohibits any rapprochement along simpler lines.

2. Downstream from the heavy chemical sector, it is desirable for the French chemical industry to have a range of plastics in the higher value-added categories. The companies now active in this area will be asked to submit a coordinated production and marketing program for their existing products, and for the development of new products.

3. The Southwest region has accommodated a good many chloride chemical plants now owned by Chlor, PCUK, and Rhône-Poulenc. All this processing capacity must be reorganized along more logical lines.

The heads of SNEA and Rhône-Poulenc will be assigned the mission of proposing the procedures for regrouping, both global in one of them, and divided between two major forces in the other: the PVC system on the one hand, and the non-PVC chlorinated product system on the other.

4. In order to cope better with foreign competition, it seems desirable to cut back on the number of operators in the fertilizer sector, and accordingly the five corporations concerned, Rhône-Poulenc, CdF Chimie, Paribas-Cofaz, ELF, and EMC will be asked to propose a regrouping of efforts in two of the companies concerned, with supplies of raw materials also being closely coordinated between them.

5. Heavy mineral chemical operations, aside from fertilizers, are not in bad shape, and are still showing a profit. It is important here to get everything we can out of the assets which EMC, Rhône-Poulenc, and PCUK hold. Their heads will be called upon to come up with a joint strategy for developing the most promising products for the future in the best possible plants.

6. The French chemical industry's best bets, when it comes to jobs and value-added, are concentrated in advanced chemicals. This portion of the industry lacks the necessary connections and tie-ins with the thinking in the major petrochemical and mineral operators.

Advanced chemistry, on the other hand, requires technologies that will work in a variety of small markets where industrial and marketing domination must be worldwide. We must concentrate the efforts of each operator on the markets he dominates.

The heads of Rhône-Poulenc and SNEA will be responsible for suggesting, sector by sector, a plan of action with one clearly designated leader. This is what must be done, if the state is to be able to make sure that the very large sums needed to expand the chemicals sector are to be put to the best possible use.

NEW STRUCTURES

While respecting the managerial autonomy of the state-owned companies, it will, in the end, come down to proposing boundaries between their activities, and coordinated scheduling of operations. It therefore seems to us that reorganization of the state-controlled chemical industry will have to be concentrated around three major poles: Rhône-Poulenc, ELF-Aquitaine, and CdF-Chimie.

a. Rhône-Poulenc

This conglomerate will have as its essential objective to build up its identity world-wide as a major force in the fields of health, advanced chemistry, and the bio-industries. With this aim in view it will have to buckle down and expand its research activities and its international presence.

In addition to all this, it will retain basic chemistry upstream of its major activities, hang on to the positions it wins back in certain synthetic fibers, and develop some of its more promising diversification activities, such as polyester films and data systems.

b. Elf-Aquitaine

The Elf-Aquitaine conglomerate is already heavily involved in horizontal integration: its participation on a par with CFP in ATO-Chloe, its array of advanced chemicals subsidiaries (CECA, M. and I, etc.), and Sanofi, the second-biggest pharmaceutical firm in France, its holdings in parachemistry (housing and paints, for example) and bio-industry, and finally its American subsidiary, Texasgulf, a major producer of phosphates and fertilizer.

Along with new financing for modernizing ATO-CHloe's industrial plant, the ELF corporation will acquire a majority interest in this conglomerate and will take over management of industrial operations.

In addition, reflecting its concern with streamlining halogen chemistry and expanding advanced chemistry, the Elf-Aquitaine group will, between now and the end of 1982, take over most of PUK's chemical activities with the exception of its coloring-agents division. Once that takeover has occurred, it will be up to Elf-Aquitaine to negotiate with the other members of the chemical community over certain reclassifications of activities.

Once these operations are completed, SNEA will emerge as a chemicals conglomerate of world dimensions, with a sound balance among its heavy chemicals, halogen chemicals, and advanced and pharmaceutical chemicals.

The coloring-agents division of PCUK, which will remain for a time in PUK, cannot hope to regain its health in the long run anywhere but in cooperation with another European producer.

c. CdF-Chimie

Quite naturally, it will be up to this group to promote, with help from the nationalized coal mining companies, the outlook for coal chemistry;

1. In the short term, though, it will have first of all to restore some degree of balance among its petrochemical activities.

Furthermore, CdF-Chimie will have to step up its competitive abilities in nitrate fertilizers and expand some of its chemical specialty activities, such as adhesives, paints, inks, and certain special-purpose plastics. Without prejudice to the outcome of discussions anent the six avenues of action set forth above, the ultimate fate of EMC remains to be decided. A number of possibilities might be contemplated for its chemical activities, most of them located outside France. One such possibility would be to expand the role of this group in mineral chemistry and in raw materials for fertilizers.

* In the fertilizer industry, simplification of the marketing channels will save farmers the excess charges for distribution which are a heavy burden to them today;

* In petrochemicals, two groups involved will be asked to help revamp the downstream sector of plastics processing.

Nationalization makes it possible to put an end to the personal and corporate rivalry that had kept the French chemicals industry in a state of Balkanization that would eventually have meant its death. It is now up to these executives and their management teams to mould these groups faced with a difficult situation into dynamic and profitable companies, the only kind that can bring us social progress and new jobs; but this will be possible only insofar as the state plays its role as shareholder to the fullest and, beginning this year, makes the financial contribution essential to get our chemical industry back on its feet.

6182

CSO: 3102/360

CHEMICALS

RESTRUCTURING OPTIONS FOR CHEMICAL INDUSTRY DISCUSSED

Paris LE MONDE in French 4 May 82 p 23

[Article by Andre Dessot: "Restructuring the Chemical Industry: A Costly Operation That Causes Hesitation"]

[Excerpts] Pierre Dreyfus, minister of industry, was to make a presentation to the cabinet 28 April about the broad directions selected for restructuring of the French chemical industry. As on the two preceding Wednesdays, this speech was put off until a later date. The chemistry file is thick and, although the sector-by-sector analysis of the situation has been finished, the work undertaken to find the solutions that are the best adapted to reforming this industry is dragging.

Four Poles?

The basic idea supposedly is to create three or four poles, one "petrochemical" around Elf Aquitaine, the other "fine chemistry" with Rhone-Poulenc as leader, the third for heavy chemistry and coal chemistry under the direction of CdF [French Coal] Chemistry and the vocation of the fourth yet to be defined.

It is beyond this fairly loose outline that matters become complicated, with the entire solution revolving around the eternal question: How do you cut up without mutilating?

All of the working hypotheses have been foreseen and all the possibilities evoked. In the name of a certain industrial logic, certain parties advocate withdrawing all its chemistry from PUK [Pechiney Ugine Kuhlmann] and then dismanteling it by adding the "fine chemistry" activities to Rhone-Poulenc, its chlorine branch to ATO [Aquitaine Total Organico]-Chloe in the process of regrouping, with Pharmaka (pharmaceutical subsidiary) being free, it appears to promise, to become a structure for receiving small laboratories in difficulty. Finally, half the dyes could be sold to a foreign group within the framework of a joint venture. It is said that EMC [Mining and Chemical Enterprise] could also be cut up. Its animal feed activity [Sanders] would go to Rhone-Poulenc, which is already well armed in this branch, its interests in PVC to Tessenderloo (Belgium) to CdF Chemistry (or

to ATO-Chloe) and its potassium to Elf Aquitaine. However, this idea does not have unanimous support either and, depending on the fate of EMC, government employees would like to make a homogeneous group of it again or frankly attach it to ATO-Chloe. As for fertilizers, that branch could be taken from Rhone-Poulenc and joined to the activity carried out in that sector by Cofaz [French Nitrogen Company] (Paribas Total). But certain parties are not excluding the idea of dismanteling Cofaz and joining its various parts to APC [Nitrogen and Chemicals] CdF Chemistry). But then what is to be done about Rhone-Poulenc's fertilizers?

While it is criticized on the finance level, the case of Rhone-Poulenc raises the fewest problems from a structural standpoint, since the group is the only one that has succeeded in hedging its risks. It would be given means to reinforce itself further in fine chemistry and to lighten up in synthetic fibers in carrying out its restructuring plan. What will come out of this intense reflection?

In 1971, when he was president of EMC, Claude Cheysson, who is today minister of foreign affairs, had declared to ENTERPRISE (13 Feb 1971): "In order to limit the damages, we must be realistic enough to adapt our capacities to the real market conditions, which means that we must harmonize our production. That implies the closing of 'mothballing' of shops." Will those who govern us take their inspiration from this philosophy in their search for solutions? That seems likely. It seems to have been admitted already that surgery will be inevitable. The deep divergences of views on the operations to carry out, the fear that is felt in high places of severing badly and too brutally, but also the frequent disagreements found between the strategies proposed by the industry leaders and the unions within the framework of a concerted effort, essentially explain the delay in carrying out the work. In any case, the application of the remedy must be accompanied by a strong dose of oxygen. Since its investments have leveled off, in good and bad years, since 1975 at around Fr-6 billion (instead of increasing by 15 percent), the French chemical industry would need, at the very least, 15 billion to get off on the right foot. At least half of that could be devoted to the consolidation of its debts, a quarter to the reconstitution of its own funds and the rest going to [capital] investments.

The question arises as to whether the public powers have the means to back up their policies. An insufficient injection of capital or an inadequate remodeling would possibly lead to a failure of the nationalizations. Everything suggests that the real restructuring of the chemical industry is not really going to take place tomorrow and that the state will limit itself to setting down broad guidelines to the group leaders, charging them with agreeing among themselves directly in the field, according to the criteria selected, with a modest covering [of funds] for the most pressing needs.

9969
CSO: 3102/259

BRIEFS

RESTRUCTURING FRENCH CHEMICAL INDUSTRY--Will the crisis afflicting the French chemical industry bring about its restructuring? That is the question that comes to mind after the report of the council of ministers session on 12 May 1982. The minister of industry apparently announced a restructuring around three major poles, with the essential part of the chemical activities of PUK [Pechiney-Ugine-Kuhlmann] being attached to Elf Aquitaine. The two other poles would apparently be CDF Chemistry and Rhone-Poulenc. Such a restructuring should put an end to a two-headed sort of direction: Ato Chimie and Chloe would be taken over by Elf. Pechiney's fate remains unknown. Ugine Kuhlmann and its sister companies have been losing money for several years (700 million francs in 1981) and the association with Occidental Petroleum failed. PUK will be taken over by Elf which could receive a capital input so its financing capacities will not be strained. Then, Rhone-Poulenc would specialize in "fine" chemistry. The entire plan still seems quite vague. Some modifications and changes in boundaries are apparently under study now. The government is determined to play its "role as an arbiter and as a stockholder" while giving to the chemical industry "the resources of a definite policy." It should be made clear that after the nationalizations, the government now controls 54 percent of the basic chemistry industry, 14 percent of the parachemical industry, and 28 percent of pharmaceuticals. [Text] [Paris SEMAINE DE L'ENERGIE in French 18 May 82 p 7] 7679

CSO: 3102/310

ELECTRONICS

DANISH INSTITUTE BUILDS SUPER-COMPUTER-BASED SIMULATOR

Copenhagen BERLINGSKE TIDENDE in Danish 11 Jun 82 p 8

[Article by Erik Bendt Rasmussen: "MOSES Is a New Super-Computer"]

[Text] A super-computer, MOSES, which is to be put into commercial production, has been developed at the Industrial Engineering Institute at the Technical University of Denmark. Its specialty, among other things, is simulation of the functions of technical and administrative systems. Its price class is from a half million to two million kroner. A patent has been applied for in the USA. Brüel & Kjaer and the Swedish Mechanics Federation have ordered two systems.

At the Industrial Engineering Institute at the Technical University of Denmark a super-computer has been developed which to all appearances will be able to fill a special niche, principally in the export market. Major Danish industries have shown considerable interest in the computer, which is called MOSES. It stands for MOdular Symbolic Electronic Simulator.

MOSES a Success

MOSES is no ordinary computer. It has been developed specially for simulating complicated technical and administrative systems, but it can also simulate physiological systems like, for example, circulation of the blood or kidney functions. MOSES can also be used in factory planning and management, for example, if new production tasks are to be introduced into production.

The first MOSES has shown what it can offer. In Denmark Brüel & Kjaer has ordered a MOSES for its own use and the Swedish Mechanics Federation (corresponds to the Danish Employers Federation and the Iron Industry's Employers Federation) has reserved a system. They are being built at the Industrial Engineering Institute, AMT [Mechanical Technology Department], with the assistance of a number of subcontractors, including Brüel & Kjaer. But since it is not the institute's real job to build computers in series, the plan is to find a firm which can produce MOSES.

The head man behind the super-computer is Graduate Engineer Licentiate in Engineering Kaj Jensen, who as a licentiate candidate developed the MOSES system under the guidance of Professor C.H. Gudnason, chairman of the Mechanical Technology Department.

MOSES will cost from a half million kroner to 2 million kroner depending on the system's size. Kaj Jensen has already applied for a patent for MOSES in the very native land of computers, the USA. This is due to the fact that, according to Kaj Jensen, this is the most difficult place to begin; for one thing, the patent law requires that a system be able to be built on the basis of the accompanying drawings.

Price 5 Million Kroner

What makes MOSES brilliant? First and foremost it is a computer-based planning system--not an electronic computer in the traditional sense. It has a very fast computing speed. It will not "chew up" a rather long time on programming and the answers appear instantaneously on the screen.

Head man behind MOSES, Graduate Engineer Licentiate in Engineering Kaj Jensen, Technical University of Denmark, with MOSES system [Photo not reproduced]. Each square box which can be seen on the board is a self-contained microprocessor. By combining them, planning courses can be constructed, which via the computer on the left appear on a screen.

Moses has been under development since 1975. The first few years Kaj Jensen succeeded in obtaining a number of smaller appropriations from foundations for introductory experiments. But from 1979 it became more and more expensive and in 1981 it was necessary to get money for manufacture of the first four prototypes. It was possible to procure very large amounts; for one thing the Technology Administration gave 1.8 million kroner from the support system for the development of socially desirable products. From 1975-1982 private foundations and firms and the public sector supported the MOSES project with about 5 million kroner. And with the large grant in 1980-1981 it was possible to start the production of four MOSES systems. Of these Brüel & Kjaer and the Swedish Mechanics Federation have ordered one each and the institute has two for its own use and for consignment to potential users. The institute will also arrange courses. Industries, public administrations, hospitals, etc., will have an opportunity to try MOSES. No previous training in electronic data processing is required.

Set Up a Firm

Meanwhile last year the institute lived with Moses and the problem that it had to be put into production on a broader scale. The McKinsey & Co. consulting firm was given the job.

"The answer was that it was necessary for a production firm to be set up very quickly or for a division to be established in a firm for taking care of production," Kaj Jensen reports. "We looked around for a Danish firm and talked with some. It seemed that the production question was easy to solve, but the firms found that the marketing job was too big. So McKinsey and the industry advised us that we let the product be tried by users in order to gain a reliable point of view concerning further development and marketing. Therefore, Brüel & Kjaer and the Swedish Mechanics Federation will soon have two systems. The Danish electronics firm and the Swedish organization are, incidentally, our partners in the project so they get MOSES at cost."

Professor C.H. Gudnason characterizes MOSES as a very large and exciting project for the Industrial Engineering Institute, because the hardware is electronics--a field which the institute normally does not operate within in development work. Via MOSES the institute has been in close cooperation with economists, physicists, physicians and ecologists, who have supplied the institute with valuable knowledge for use in further development.

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CSO: 3102/322

BRIEFS

THOMSON FLAT-PANEL DISPLAY--Among the variety of new components that Thomson is counting on in 1982, there is a flat-panel plasma display system, the TH 7606 with 512 x 512 cells. Its display capacity of 64 lines of 85 5 x 7 characters or 32 lines of 64 7 x 9 characters is suitable for use on a video terminal. It features rapid access without distortion or fluttering of the characters and graphics. Its memory is unlimited and its brightness can be adjusted. The integrated control electronics can use an underliner and a moving indicator. An optional interface card built around the μP SFF 96802 transforms the panel into a terminal which can be connected directly to a standard data line. Might this panel be the first flat-panel display component, which all the makers of data display consoles have been waiting for, to catch on in the market? [Text] [Paris ELECTRONIQUE INDUSTRIELLE in French 15 Apr 82 p 12] 7679

'MICROMEGA 32' MICROCOMPUTER--Thomson's "Micromega 32" has just been officially introduced. As we indicated last fall, this microcomputer is sold in the United States by the U.S. company, Fortune, in which Thomson-CSF holds 35 percent of the stock. ("We are the only industrial partner," said Jacques Imbert, director of Thomson-CSF's business information and communication systems group). Built around a 68000 with the Unix operating system, the Micromega will sell for a price range from 55,000 francs (128 K 8-bit system, double disk with 800 K 8-bit system) and 160,000 francs (a four-position version). The price includes the programming language and business applications software. Sales will be handled both directly and indirectly through distributors (there are about 20 distributors now) and by the SSCI [expansion unknown], primarily for PME [Small and Medium Businesses] and PMI [Small and Medium Industries] markets. The first evaluation models will be ready in the next few months. Large-scale sales will only begin in September. The Micromega, at the top of the line of microcomputers of the Apple III type, is now being manufactured in the United States. Starting in 1983, it will be built in Brest for the French, African, and Middle East markets, where Thomson-CSF holds exclusive sales rights. The sales target for 1986: 8,000 for France and 4,000 for the export market. [Text] [Paris MINIS ET MICROS in French 26 Apr 82 p 23] 7679

CSO: 3102/311

FRENCH ORGANIZATIONS STUDY EFFICIENT USES OF ENERGY

Paris L'USINE NOUVELLE in French Apr 82 p 149

[Article by D.-M.B. "Rational Use of Energy: A 'Fluidized Bed' for Coal'"]

[Text] Thermal energy perhaps does not give rise to as many vocations as the general concern about "using energy rationally" would at first lead one to believe, because there really are enough men capable of carrying out the research, which is lacking. At the CNRS [National Center for Scientific Research, it is recognized that it is always possible to redeploy personnel. But while transfers from particle physics to solar energy have been possible, they have not been self-evident. And who will volunteer to "go into coal?" The increasing recourse to this energy will, however, require many additional studies.

To begin with the handling of this heavy fuel: In addition to the traditional operations of sorting and crushing, there is the transportation itself. A modern method, totally pneumatic--specifically at Neu--puts coal out of sight of the users, but it still requires additional effort. The use of powdered coal is attracting the particular attention of manufacturers of burner and handling equipment. Objective: lower the power capacity of facilities. Today, only thermal power plants or cement factories can use this fuel in this form.

Another direction of the future: "fluidized bed" solutions. A better mastery of heat transfers and a greater flexibility of operation appear to be imperative before boilers of this type, which are capable of using coal from various sources, become widespread, because, while it is domestic and the supply is certain, coal from mines in the south of France has a very high sulfur content. And except in the case of a powerplant with a 300m-high stack, its use seems to be compromised by the problem of pollution.

On the question of environmental nuisance, CERCHAR [French Coal Board Research Center] is planning to pursue various experiments. A promising theme: sleeve filters which clearly contribute to environmental improvement. At CETIAT [Aerolics Industry Technical Research Center], too, this aspect is giving rise to studies, specifically on the theory of coal use by

gasification or liquefaction. The high temperatures encountered (on the order of 1,000°C) are orienting the choices toward solutions of a cyclone, electrofilter, or even a ceramic system type.

An Attractive Use for the Sun: Cooling

At the CETIAT Research Center at Orsay, too, renewable energy sources are being examined. On the agenda: air solar collectors and windmills.

In order to get started, a bibliographic study has made it possible to count 28 patents for wind use, 27 of which had to be eliminated. One path, which is modern, perhaps, but fruitful, seems to be the optimization of windmill operations, particularly of small ones. In order to use current research better, a COMES [Solar Energy Commission] CETIAT contract provides for data communication of the results of solar facilities. That way, the results will be more complete and more concrete.

At the INSA [National Institute for Applied Sciences] at Lyons, they are also interested in the production of solar cooling: An attractive use for this form of energy, because the absorption machines being studied, which are purely static, would cause no maintenance problems. Their performances should be better known, thanks to two COMES contracts in collaboration with the CNRS.

At Orsay, the study of load losses in the bends of aerolic circuits should lead to a better knowledge of the phenomena of ventilation and bring efficiency gains of 20 to 30 percent. Also being developed: an experimental method for determining air renewal. Using tracer gases, it is applicable to large areas and could lead to better adaption of heating power to real needs.

Among the new materials being developed, heat pumps are receiving special attention: soon an AFNOR [French Bureau of Standards] label, and already a very large investment program at the CETIAT in Villeurbanne for a test bench (more than 4 million for 1981-1982). True energy conservation is realized at this price. Also being studied are condensation heating devices which ensure a maximal use of the heating potential of fuel.

We must not forget a study financed by the MST [Ministry of Sciences and Technology?) involving an inventory of computer codes for exchangers. The objective is to put all the scattered elements at the disposal of small firms, which thus would make it possible to achieve additional energy conservation.

[picture caption] Test of powdered coal and coal-fuel oil mixture combustion in this 1 MW (multifuel pilot furnace at CERCHAR. The increasing recourse to coal will still require numerous studies.

9969
CSO: 3102/283

NEW 1.2 MW WIND TURBINE DEVELOPED IN SWEDEN

Stockholm NY TEKNIK in Swedish 20 May 82 p 4

[Article by Mikael Holmstrom]

[Text] A new wind power plant has been designed in Sweden. The new power plant will be a cross between the first experimental power plant near Kalkugnen and the large power plant erected over the weekend at Maglarp in Scania.

Vindenergi AB is responsible for the design. Vindenergi is owned by Svenska Varv and it also constructed the power plant at Maglarp (see last issue of NY TEKNIK).

The first large wind power plant in Sweden was constructed in 1977 near Kalkugnen. It was built by Saab-Scania and had a turbine diameter of 18 to 25 meters (various turbines were tested).

Government wind researchers ordered the Maglarp and Nasudden prototypes based on experience from Kalkugnen. These two plants will begin operating this year and have turbine diameters of 78 and 75 meters, respectively.

The new power plant designed by Vindenergi has a medium-size turbine diameter of 50 meters.

This power plant is a scaled-down and better designed version of the Maglarp prototype power plant. The power output is 1.2 MW, while Maglarp has a power of 3 MW. The glass fiber turbine will be constructed on the same principles as the Maglarp turbine. The tower also will be similar to the tower at Maglarp. It will be made of steel and stand 50 meters high. The same type of hub will be used as in Maglarp.

One advantage of the new power plant is that it will be easier to transport--the machine house weighs only 28 tons, compared to 150 tons for the Maglarp machine house.

This means that Vindenergi listened to the criticism of the large state-owned prototypes coming primarily from smaller power companies: the prototypes were considered too large and complex. The new power plant is similar in size to

the two Danish plants at Nibe--they have turbine diameters of 40 meters.

"If developments had been as rapid as we thought they would be when we decided to construct the large Maglarp plant, we would have had an enormous head start today. High interest rates in the United States have slowed development and, for this reason, there is a market now for power plants in the 1 to 1.2 MW range," said Nils Byggeth of Vindenergi AB.

It is not yet known what the new power plant will cost.

The new power plant may compete with the plant produced by Danish Wind Technology, which is owned in part by Asea. The Danish plant has a turbine diameter of 28 meters.

In several years there may be a battle for orders on the Danish market and in the United States.

In Sweden there may be a market for wind power plants in this class in the long run--it is primarily smaller, privately owned power companies that are interested.

If Maglarp and Nasudden operate properly, however, the State Power Board and Sydkraft probably will continue to construct the larger power plants.

Kamewa in Kristinehamn which is constructing the Nasudden plant also intends to continue with the larger size. At least no small-scale power plants have been designed in Kristinehamn as yet, NY TEKNIK learned.

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CSO: 3102/351

BRIEFS

EXPLOITATION OF BIOMASS--An economic interest group, specifically including the Solar Energy Commission and the French Petroleum Institute, will be formed very shortly for the construction and operation at Attin (Pas-de-Calais) of a demonstration unit for the butyl acetone fermentation-distillation process from mangel-wurzel and Jerusalem artichokes. The alcohol production capacity of this unit is to be 10 tons a day. In another context, the Solar Energy Commission has published the list of equipment selected for the energy exploitation of animal wastes by methanization on which are found, among others, the names of Air Liquide and PEC-Engineering. [Text] [Paris CHIMIE ACTUALITES in French 12 Mar 82 p 1] 9969

CSO: 3102/259

BELGIUM BOASTS ONE OF EUROPE'S MOST MODERN STEEL PLANTS

Paris INDUSTRIES & TECHNIQUES in French 20 Apr 82 pp 59-61

[Article by Jacques Houbart]

[Text] Not long ago, industrial clusters or "konzerns" were a sign of power and a symbol of success. Today, with the world-wide changes in industry and the threat of unemployment, many sectors are closing ranks in defensive concentrations. This is true of the Cockerill Sambre steel mills, one of Europe's leading steel industries, which since June 1981 has been concentrated in the two poles of Charleroi and Liege. And yet, the plants which make up this complex are the sixth leading producers in the EEC: 6,875,000 tons of steel; of this, 3,525,000 tons comes from the Liege region, and 3,350,000 tons from the Charleroi region. It also accounts for 78 percent of the steel used by the Community. Nonetheless, most of Belgium's steel facilities are not at all outdated, being actually quite modern. The Carlam rolling mill is the newest and most modern in Europe. Its capacity, if the EEC and Nippon Steel will allow it, should even rise from 1.7 million tons to 2.6 million tons. And the new Valfil wire mill, whose production capacity is 1.15 million tons, is the largest in the world, and one of the most modern.

But the current capacity and performances are not what really count. The Belgian steel industries are not afraid of future shock, but rather of the shock of foreign steel. Ever since World War I, the steel industry has developed on several continents. Today Japan has the steel industry with the top performance in the world, and the PVD [Developing Countries] are beginning to export. They do have several points in their favor: the expansion of national needs, the low cost of labor, and the abundance of local ore or of local energy resources. Brazil, India, Mexico, South Korea, and Argentina are already heavily involved in steel production.

Since 1960, worldwide steel production has more than doubled. To the problem of the overproduction of low quality steel has been added the severe crisis in the automobile and construction industries. Of course, worldwide steel demand is enormous, but a Malthusian sort of reflex has kept the industrial countries from building housing, automobiles, and the electric power plants which are essential for the development of so many countries. For example, in Belgium the EEC's plan, which is based on a Nippon Steel study evaluating the possibilities of steel sales, calls for reducing the steel production capacity from 11.2 million tons to 8.5 million tons.

More Economical Castings

As it is not up to Cockerill's engineers to unravel this situation, the group's directors have chosen the only strategy possible: the development of technology, of research, and of diversification. Cockerill Sambre does have some effective arms in this area, and its research and development labs are working feverishly.

Just a few weeks after the new concentration, the board of directors approved a plan for the installation of three new continuous casting lines: one slab casting system at Chertal; one mixed slab and bloom casting system at Seraing; and one mixed slab and bloom casting system at Marcinelle. This continuous casting system is already familiar to Cockerill Sambre, and it does increase productivity. Using this process, it is possible to go directly from liquid steel coming from the casting ladles of the steel mill to the slab, which is a flat semi-finished product obtained by the first rolling of an ingot heated in pit furnaces. The slab is then ready to be placed in the rolling mill in wide strips.

The continuous casting process avoids the necessity for casting in ingot casting molds, cooling, and unmolding of the ingots, then their reheating in pit furnaces and rolling in slabs. It does save materials (no more metal losses in molding and unmolding theingots and no more losses in the fire of the furnaces), and it is a highly energy-efficient method.

While high performance steel mills often have continuous casting systems, some new and absolutely unique technologies are being developed by Cockerill Sambre. About 18 months ago, the group successfully started the application of a new continuous annealing process for cold-rolled sheets. This is done at the old

galvanization line no 1 at Phenix Works, which is a wholly owned Cockerill Sambre subsidiary. This process, which is called HOWAQ [Hot Water Quenching] is patented by the CRM [Metallurgical Research Center]. The reason why the sheets of steel can be cooled by water at a temperature of 100°C is that they were first heated to 700°C.

Steel's malleability is of particular interest for manufacturing car bodies, so this process is of great interest to the automobile manufacturing industry. During the precipitation of carbon atoms at the time of cooling, these atoms, instead of remaining trapped in the iron crystal, form small crystals scattered throughout the mass of the steel and do not decrease its ductility. One of the advantages of the CRM-Cockerill procedure is that it reduces the time period of precipitation to 40 seconds.

The HOWAQ procedure has much better performances and is more economic than procedures under study by the Japanese (gas blasting by Nippon Steel and the cold water blast system of Nippon Kokan). In order to harden steel, additives are placed in it at the steel mill. These additives are expensive, and by using the HOWAQ procedure, high resistance steels with a minimum of alloys can be produced. Moreover, the HOWAQ procedure, during which a strip of steel with 110,000 calories per ton is immersed in boiling water at 100°C, produces steam. And each kilo of steam condensing at 100°C provides 540 kilocalories to a colder body. This steam can be used to heat a fluid which could power a turbine. For a HOWAQ continuous annealing line with a capacity of 500,000 to 600,000 tons per year, it has been calculated that the power of the small electric power plant it could operate could be about 3 megawatts!

The HOWAQ process is an advantage for the European automobile industry, since it produces sheet steel that is easier to roll and decreases the weight of cars. The steel is thinner, while still maintaining the same rigidity and the same resistance to corrosion. Another method, developed at Cockerill by Phenix Works, is also attracting some interest from the automobile industry. This is a type of galvanization, which is so valuable in protecting car bodies, which are particularly prone to damage from the salt spread on roads during winter. Standard galvanization, which is done by circulating the steel to be protected in a zinc bath, produces a zinc coating on two surfaces. This is troublesome for automobile bodies, as it causes problems when welding the steel.

Moreover, a zinc coating on the surface to be painted is not wanted by the automobile manufacturers, for it causes some difficulties when preparing the surfaces. Rust acts to destroy car bodies from within, so why not try galvanizing just one surface? For this reason, Phenix Works has developed a unique process which has completed very satisfactory tests. The method was developed by a team working under V. Polard.

In this process, the steel strip is no longer submerged in a molten zinc bath at 450°C, but one surface rests on a cylinder that rotates in the zinc bath. The other surface of the steel never comes in contact with the molten zinc. This application may also be extended to coatings other than zinc, and may be of use in some other sectors, such as household applicances or metal packaging.

The Japanese industrialists are very much interested in the research being done at Cockerill Sambre, and are happy to make the trip to the shores of the Meuse. Still, we must hope that the EEC--which can certainly show its energy when it's a matter of limiting its production--will be daring enough to intervene to protect this innovative effort of the Community.

The concepts of technological transfer and diversification also motivate the staff of HS Innovations. These steel industry development units have played a major role in the development of the improved nozzle for an OBM converter which lengthens the life of nozzles, thus reducing steel production costs. This new product, which was invented at Charleroi, has been purchased by Usinor, and some other steel industries are also considering it. HS Innovations is also handling the Carmaid operation, oriented toward diversification.

From 12.5 Hours per Ton in 1975 to 6.7 Hours per Ton in 1980

The Carmaid is a small but very high performance loader, which can be used for difficult industrial handling procedures, such as agriculture, horticulture, and animal breeding. It is easy to handle, compact, sturdy, and stable, and works in an area as small as 40 cm. It is a sort of "maid of all work" which goes in places where other machines can not fit. It is the only hydrostatic transmission device with a hydraulic servo-system equipped with a wheel-driven motor. This means that mechanical transmissions and their attendant problems can be eliminated. The Carmaid can handle loads of 700 to 900 kg, and on rail, can pull a load of 40 tons.

If technical progress is all it takes to get around the dangerous turning point that Cockerill has reached, the "Cockerillians" should be hopeful. Their productivity rose from 12.5 hours per ton of finished products in 1975 to 6.7 hours per ton in 1980. There has been a strong emphasis on quality, and the equipment of the quality research service goes far beyond the standard equipment of any modern metallurgical laboratory. This avant-garde service also manages the ESR [Electro Smalt Remelting] facilities. These provide very high quality alloy steels for defense, for the nuclear industry, and for cold-milling cylinders.

7679
CSO: 3102/310

RENAULT SAYS RVI FLEXIBLE WORKSHOP MORE ADVANCED THAN OTHERS

Paris LE FIGARO in French 6 May 82 p 11

[Article by Vincent Gerard]

[Text] The workshop covering 3,000 square meters is light and not very noisy for a facility of this type. On the wall is a huge mural painted in bright colors: circles, triangles, geometric shapes representing gears. The workers, who were offered a choice among 12 designs, chose this one. Everywhere is the smell, getting into clothes, caused by the blend of oil and water used to keep the parts being machined at high speeds from overheating.

Self-propelled carts guided on the floor by an almost invisible wire move around slowly in a stunning ballet, bringing their cargo to the machine tools. A clever device hidden away in the computer room controls traffic: there will be no accidents here. The carts yield the right of way, and then pass, or if they have nothing to do, they stop in rest areas.

This is the most spectacular part of the RVI [Renault Industrial Vehicles] flexible workshop at Boutheon, located in the suburb of Saint-Etienne. But it is not the most important. What matters is not the carts moving around, but the constant use of the machines. At any moment a computer can direct the right part on the right cart to the right machine. So there are no piles building up here, unlike other workshops, where parts clutter up the shop while waiting for a machine tool to be free. This is what makes the Boutheon flexible workshop the most modern in the world.

This isn't a sort of swaggering nationalism; it is a reality which is made clear by comparison with foreign developments. Catherine Dupont, the CNRS [National Center for Scientific Research] staff member who developed the entire system, explains:

"At Fujitsu-Fanuc in Japan, the flexible workshop has only two carts and the loading and unloading of parts on the machines is done manually. At Boutheon, this operation is automatic. And again in Japan, at Murata-Machinery, the parts are loaded automatically, but the system isn't operated in real time. Operators have to decide which parts to put on the machines that are free."

"In the United States," she continued, "Cincinnati Milacron has a flexible workshop, but it is a demonstration unit, and isn't operational like the RVI. Messerschmitt in Germany has a flexible workshop that machines parts for the Tornado plane, but it uses workers to clamp the parts on to the machining centers. And in Italy, Camau, a Fiat subsidiary, has two assembly plants that they claim are flexible. But there the body part is attached to the carts, and the operations are not done in real time."

On this basis, the Boutheon workshop may be considered a worldwide first in the field of machining. It has managed to reconcile two contradictory requirements: diversity and large-scale production. Industrialists know quite well how to produce a large number of identical parts with excellent productivity. And they also know how to manufacture highly diversified parts, but at the cost of a terrible productivity rate.

In the flexible workshop, these two parameters can be combined. The basic principle of this type of shop is very simple: when a machine says it is free, the management system automatically determines, from among the group of parts to be made, the ones that are at the right point for this machine. Of these, the best part is selected, based on priority rules set in advance.

The Boutheon plant is now producing gear systems for heavy vehicles. The flexible workshop machines crank cases for new gear systems of a type that had been imported earlier. The investment was 45 million francs for this facility.

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CSO: 3102/293

RENAULT FLEXIBLE WORKSHOP OPERATES IN REAL TIME

Paris L'USINE NOUVELLE in French 6 May 82 pp 66-67

[Article by Patrick Piernez: "A World First at Renault"]

> [Text] After the United States, Japan, Germany and Italy, France has just entered the very closed circle of users of flexible workshops. The one which Renault Machine Tool Company has just completed for Renault Industrial Vehicles constitutes a world first by virtue of its level of automation and its management of production in real time.

Renault Machines-Outils [RMO--Renault Machine Tool Company] made an ambitious bet: to profit from its lag by skipping 2 generations and developing a computer program capable of using the flexibility of its carriers to make the right decision in the workshop at all times. Renault won its bet...

This achievement, followed with great attention by foreign experts, will to a large extent open to France the European market for flexible workshops. Everyone has been waiting until now to see the Boutheon workshop in operation before deciding. In France alone 15 flexible workshop projects are the object of commercial negotiations in the fields of aeronautics, shipbuilding, mining equipment, valve production, electrical construction, weapons, bicycles...

The decisions were not long in coming: In less than a month RMO "pocketed" two orders for flexible workshops--one for Messier-Hispano-Bugatti in Molsheism and the other for Caterpillar in Grenoble. In this market RMO can now compete effectively against the other European builders, such as Burkhardt-Weber or Heller in Germany, or Comsu and Olivetti in Italy. The national enterprise is also scoring points over other French challengers, such as Automatique Industrielle [Automatic Industrial Plant], an affiliate of the Societe Generale [General Production Company] and PSA [Peugeot-Citroen Company], which is now building a flexible workshop in Meudon for Citroen.

Claude Billaud, manager of RMO, is showing a certain satisfaction with this success, even though it is somewhat tempered by prudence: "We do not anticipate a sharp increase in sales. The share of flexible workshops in our machine

tool operations should grow steadily without for all that exceeding 15 percent in the next 3 years." This is nevertheless relatively significant figure when one realizes that machine tool activities account for some 680 million francs out of a total 1.4 billion in turnover at Renault Industrie Equipement et Techniques [Renault Industrial and Technical Equipment Company], which also includes the Renault group's "robotics" and "engineering goods and services" operations.

Investments Which Must Be Divided

This prudent approach is explained in part by the cost of installations (that of RVI [Renault Industrial Vehicles Company] totaled 45 million francs in 1979), leading the users to divide their investments. The principle is familiar: A workshop is planned in several stages; with the following advantages: a staggering of investments, greater facility in startups and adaptation of production to the needs of the market. That is what has been realized by Messier-Hispano, where only two machines out of five have been ordered, but also by RVI Boutheon, where an extension is planned to meet the growth in demand.

The RVI workshop Boutheon was designed to produce the crankcases of RVI's new top-of-the line item, the B-9 gearbox. This synchronized mechanical gearbox (10-speed gears) is slated to equip 220- to 400-horsepower freight trucks and tractors. This product is the result of 7 years' research at RVI, which has great commercial hopes for it. A total of 75 units were tested over a distance of 600,000 km. The gearbox will replace three other models: An RVI model, but also two foreign models which have so far been imported (the ZF synchronized gearbox and the Fuller high-torque gearbox).

This gearbox has three elements: the principal crankcase, the intermediate crankcase (in gray cast iron), and the rear cover made of aluminum alloy or GS cast iron, depending on whether it is used as a simple cover or suppoert for the electromagnetic decelerator. Thus, there are now 4 different elements and later, when the RVI produces all the variations, there will be 12 to 16. Similarly, production, now limited to 25 gearboxes a day, will gradually increase to 70 a day with a 3-shift operation. In 1983 additional investment will raise production to 100 gearboxes a day. "It is this adaptability of use which justified our desire to acquire a flexible workshop," Andre Morel, manager of the Boutheon plant, explained. "This workshop will constantly adapt to our needs with an equipment utilization rate close to 80 percent, whereas it is known that after 15 years of service some assembly lines no longer operate at more than 20 percent capacity."

Another determining advantage of this flexible workshop is the complete elimination of the need for adjusting settings in order to change from one product line to another. This makes it possible to work in direct flow between manufacture and assembly and thus to eliminate inventories. "On our old assembly line we needed 17 hours to change from one element to another. We thus produced sets of 1,500 units that we stored before assembly. Today we no longer have inventories: A few seconds are sufficient to change elements. We manufacture units gradually, as the need arises. Better still, in the future the workshop will be able, with less than 4 hours needed for adjustments to produce a second, different gearbox.

This flexibility of adaptation to the product is accompanied by a flexibility of reaction to equipment breakdowns. "In case of the lengthy breakdown of one of the machines, the computer activates emergency equipment making it possible to work the units either on a piece of equipment of the same type or on a production unit, whose memory core is programmed with finished units--for example on the reaming-straightening piece of equipment," Claude Billaud explained.

A Decision by the Computer Every 6 Seconds

This flexibility of adaptation is enhanced by the use of carriers guided by wires sunk in to the ground. The elimination of rails and roller-assisted conveyor belts makes it possible to move the pieces about with unequaled speed. This technique has just been adopted in the most recent plant construction projects around the world, such as Messerschmitt in Augsburg, or Fanuc or Murata in Japan. "But Renault alone has pushed automation so far," Catherine Dupont of RMO noted. In the Boutheon workshop the units are not only moved from one piece of equipment to another, they are also loaded and unloaded automatically. Furthermore, the electric carriers do not require any manual operations in changing batteries."

However, the great pride of Catherine Dupont (who is also a researcher at the CNRS [National Center for Scientific Research] is control in real time. "The computer makes a decision every 6 seconds. It anticipates the timely feeding of supplies to the machines as they run out, but it also allows an individual piece to be worked on a priority basis and relieves bottlenecks." This is an indispensable answer to the problem of eliminating stock pileups and waiting lines in this workshop where production time takes between 1 and 9 minutes...

The data-processing center includes two Solar 16-40 (SEMS) units with a power of 128 K hooked up to a "black box" indicating all the operations effected during the last 40 minutes: It is a precious tool for the personnel charged with insuring the progress of the manufactured items.

Since 1980, the plant has created 100 jobs and assigned 15 workers to startup operations and the programmed assembly of this new tool. The workshop functions with five technicians per 8-hour shift. They are assigned to the loading and unloading of units on the pallets, maintenance, followup chores at the workshop, and the setting of adjustments for the tools. For their training Renault "went all the way," including 10,000 [as published] hours of training (in digital controls, programmable robots, industrial data-processing and maintenance).

How Renault Won Its Bet

The Boutheon workshop is highly complex. It includes four Graffenstaden production centers, three special SMC [Mechanical Company of Castres] drilling and reaming machines, and eight SEIV wire-guided carriers.

The first difficulty which Renault experienced was to have working a large number of specialists from various disciplines, who were within the group (with the SMC, SEIV and SMC Programmable Robots) or outside it, with SODETEG

[Technical Studies and General Enterprises Company] (the computer program of the conveyor system), CERCI [Industrial Company for Cybernetic Studies and Projects] (central data-processing), NUM (digital controls), SEMS [European Mini-Data-Processing and Systems Company] (computers), and so on. But it is neither this difficulty nor that of the computer program (to everyone's surprise, the software worked flawlessly) which caused the greatest headache to Renault's engineers. Rather, it was two mechanical problems which were stumbling blocks in the project.

The first difficulty: the placement of the units on the pallets in such a way as to leave free access to the four sides to be worked. At the time of the tests, the pieces became deformed and were not up to standard. The margin of variation allowed is very strict: 2/100ths millimeters on the locating interaxles spaced 300 millimeters apart. It was necessary to optimize the assemblies of the gears of the pieces and give extreme care to the "balancing" of the unit before it was machine finished. The second difficulty was the unevenness of the ground. The workshop was built on a landfill site which became very uneven with time. And the absence of level ground hindered the development of the wire-guided carriers. The problem was solved thanks to the cunning of Renault's engineers: The wheels of the carriers were raised higher on one side and a control system for meshing the pallets on the machines was installed.

2662
CSO: 3102/285

FRENCH COMPANIES EXHIBIT LATEST MACHINE-TOOLS AT PARIS SHOW

Paris LE MONDE in French 12 Jun 82 p 40

[Article signed R.C.: "The 12th Biennial Machine-Tools Show. The Promises of French Robotics"]

[Text] The 12th Biennial Machine-Tools and Mechanical Equipment Show opened on Wednesday 9 June in Paris, at Porte de Versailles. Mr Pierre Dreyfus, minister of Industry, was to inaugurate it on Friday 11 June.

Until 17 June, 89 companies will exhibit their robotics products. Simultaneously, the International Industrial Robotics Conference is being held from 9 to 11 June.

At the opening meeting, Mr Pagesy, representing Mr Jean-Pierre Chevenement, minister of Research and Technology, gave some indications on the work of the robotics mission which should soon present its conclusions. The future program of the Ministry aims at:

- strengthening the advanced automation and robotics (ARA) program;

- organizing and energically promoting the production of sensors and motors for second-generation robots;

- providing orientation and support for activities dealing with real-time data-processing and flexible workshops;

- organizing concerted activities dealing with mobile robots for industry and agriculture;

- promoting efforts in the field of automatic quality control;

- organizing research programs on the effects of automation on the economy, on working conditions and on employment.

"The work of commissions will not create the robots we need, but manufacturers will." This remark of a marketing survey expert is a good illustration of the situation of the French robotics industry. There is still more talk than action, but maybe not for much longer. At any rate, this is what the exhibition now held at Porte de Versailles seems to prove.

Thus, CEM (Electromechanical Company), a subsidiary of the Swiss Brown-Bovery group, exhibits components for machine-tools and robots (motors, actuators and electronic components) which have been used for several years by world robotics leaders such as the Swedish ASEA [Swedish General Electric Corporation] and the German Volkswagen. Its subsidiary in robotics, SCEMI (Industrial Equipment Design and Manufacturing Company), is showing an assembly robot developed with the assistance of the Grenoble Applied Mechanics Laboratory, assembly transfer lines and... a Japanese robot, Yaskawa. A company in full growth, SCEMI is one of the assets of the future French robotics program. At present, it employs 70 people and is due to move soon to a new location at Bourgoin-Jallieu (Isere).

At the Citroen-Engineering booth, the Peugeot SA group is showing, for the first time in Europe, a CAD (computer-assisted design) robot control. A spot-welding robot designed by Talbot will be programmed in the interactive mode using a Computervision console. Until now, a robot could be programmed only instruction by instruction, i.e. the motions of a human operator were recorded and the machine was programmed to reproduce them. With CAD, human intervention is no longer necessary.

Other companies are showing interesting equipment and methods. Among them, Renault, SORMEL [Company for Mechanical and Electronic Horological Studies] (a subsidiary of MATRA [Mechanics, Aviation, Traction Company], AFMA [expansion unknown]-Robots, a joint subsidiary of Leroy-Sommer and Telemecanique), CSEE (Electrical Enterprises and Signalization Company), which exploits General Electric patents and, after remote-control manipulators for heavy loads, is now getting into oil-well and nuclear equipment).

For its part, AUXILEC [expansion unknown] (Thomson-Brandt group) is showing at Porte de Versailles only models of the equipment it has developed (robots for the assembly of parts weighing from a few grams to several kilograms).

The CEA Enters the Competition

CGE (General Electric Company), which possesses knowhow in mechanical engineering, automatic control and engineering, is also represented by its subsidiaries. One of them, CGMS (General Handling and Storing Company), has developed automated machines which will be used as a basis for robotics products; another, Workshops and Work-Sites of Brittany, has specialized in robots for operations in hostile environments (off-shore drilling, nuclear industry). Let us recall that, for a few months now, CGE has been marketing small Japanese robots in order--according to its management--to test the market.

The Atomic Energy Commission (CEA) should also reveal soon its ambitions in the field of robotics. If it is given a "green light" in the budget, it should announce the creation of one or several subsidiaries jointly with a large

national industrial partner. The CEA's work in robotics deals mainly with the following: arc-welding, laser machining and heat treatment, assembly.

Association with the Japanese?

Are the French manufacturers and researchers in a position to develop a national robotics industry or will they have to sign cooperation agreements with foreign manufacturers? The question is not yet decided. Certain groups have taken a decisive step and associated with the Japanese. CGMS [expansion unknown] is marketing the Skylam assembly robot produced by Sankyo (the very same robot that IBM recently decided to import into the United States) and has already sold 26 of them, as well as a Tosman-machine loading and unloading robot manufactured by Toshiba. The AB [expansion unknown] have signed an agreement with Osaka, the Commercy Wireworks and Workshops with Shin Meiwa. Manurhin is contemplating an agreement with another Japanese, Fanuc, but it seems that neither its principal shareholder, the MATRA group, nor the public authorities are favorable to such an association, especially since MATRA plans to develop its operations in this sector.

As far as "bottom-of-the-line" robots are concerned, certain officials feel that we should recognize our deficiencies and import until we have created companies powerful enough to enter the market with competitive products. This "realism" is reflected in the recent relaxation of certain financing procedures involving bonus loans for the purchase of imported materials. However, when it comes to "top-of-the-line" products, the same officials believe that France is in a favorable position, which explains, for instance, why CGE is basing its strategy on this type of equipment and imports simpler machines. The French manufacturers of manipulators are far from sharing these views.

To import "and see," and wait to develop our own products presents a definite risk. If we help competitors like Japan to gain a foothold in France, what will happen when that country--which at present exports very few robots but uses them to manufacture low-priced consumer goods with which it floods our markets has completed the automation of its factories and begins to exports robots too?

9294
CSO: 3102/348

PLAN TO STRENGTHEN MACHINE TOOL, ROBOT INDUSTRIES OUTLINED

Paris ZERO UN INFORMATIQUE HEBDO in French 17 May 82 p 32

[Article by Jean-Louis Cousin]

[Text] "When I say that no sector is doomed, this is based on the potential offered by automation." A few weeks away from the publication of details about the contents of what is already being called the "robotics plan," Pierre Dreyfus, the minister of industry, last week addressed leaders of the machine tool sector on the subject of the government's major options in this field. His colleagues also gave the industry representatives some information.

These exchanges between government officials and industrial leaders were part of a program called "Automation and the Machine Tool Industry in Ile de France," held at the initiative of the prefect of Paris, Lucien Vochel, and of the regional council, chaired by Michel Giraud. What was said there, added to what was already known, gives us some idea of the forthcoming "robotics plan."

Increased Funding

On the subject of financial incentives for the domestic market, Pierre Gadonneix, the director of metallurgical, mechanical, and electrical industries at the ministry of industry, made the following points:

The envelope of funding approved for robotics definitely increased in 1982 in relation to 1981, reaching 2 billion francs (compared with 1.2 billion last year).

There has also been an increase in the resources allocated for the MECA [Advanced Design Materials and Equipment] program, designed to encourage the acquisition of such equipment: 540 million francs from 1982 through 1984. "This is a sextupling of funding in a 2-year period," said Mr Dreyfus.

The formation of a financing company specializing in the area of machine tools and robotics is to be studied. This could receive a significant portion of the robotics funding envelope.

In addition to these financing measures, two other types of stimuli are planned for the domestic market.

a. A more active policy of public orders, particularly from the ministry of education, the AFPA [expansion unknown], the military arsenals, etc.

b. The establishment of a regional infrastructure providing assistance and advice for companies, known as ADEPA [Agency for the Development of Automated Production]. Its purpose will be to promote the introduction of automated materials in industry, particularly in PME [Small and Medium Enterprises]. It will expand its regional facilities in order to establish closer contacts with the PME. According to the ADEPA's director, Christian Sauvaire, it has about 100 engineers and technicians, and plans to open about 10 centers over the next few months.

These measures to provide a domestic stimulus are only one aspect of the total plan, which also calls for a reorganization of the sector, designed to form competitive units (both for machines and their componenets), and includes a training policy and the introduction of a technological innovation program.

Research Quintupling

It was reported that the research and development program will be multiplied by 5. Development spending by industry will rise during the 1981-1984 period from 50 to 200 million francs. The collective research program of technical organizations and universities will be of the same magnitude.

Three technological poles, each with a special focus, acting as coordinators for scientific organizations by means of goal-oriented research, are to be established. One will be centered around the CERMO [Machine Tool Study and Research Center] and the ENSAM [National School of Arts and Industries], the second around the ADEPA, and the third around the CETIM [Mechanical Industries Technical Center].

In their research and development programs, the machine tool companies will be encouraged to use the resources made available by these technological poles.

Quadrupled Production

Speaking of robotics, Pierre Dreyfus noted: "Over the years to come, our capital goods industries will have an opportunity to grow stronger because of the machine tools of the future, robots. This increased strength will first have to come about in the domestic market. That is why, in each of the plans which I have presented for particular sectors, we have included a development of the capital goods for that sector. Our industrial policy is based on systems which include in the same logic both the equipment used and their products."

The minister gave some information about the government's role: "All the functions of industry will be modified, and the government does plan to increase its role as an advocate of automation. It will do so by means of several effective procedures: the CODIS [Committee for the Development of Strategic Industries], whose "robotics" is one of the priority areas; the dissemination of innovation by the Data Processing Agency; and the MECA procedure."

Michel Courtois, the leader of the French Machine Tool Builders Union, remarked that the average age of French machine tools is now 15 and 1/2 years. Only 20 percent of the machine tool stock is less than 10 years old, compared with more than twice that in the United States, and nearly 2/3 of the stock in Japan. About 56 percent of the PMI [Small and Medium Industries] in France have no automated equipment at all.

The inadequacy of our stock of digitally-controled machine tools was pointed out: under 10,000 units, while the Federal Republic of Germany has 30,000, Japan 50,000, and the United States, 70,000.

The plan calls for quadrupling their production, increasing their share of production from the present level of 27 percent to 60 percent in 1985. And the total production of machine tools itself should double from its present level. At the same time, the national stock of digitally-controled machines should be increased to 26,000 units. At present, about 15 businesses are now about to award contracts, so they can become poles for development, by means of commitments made in specialization, standardization, research, training, and increased sales volume.

7679
CSO: 3102/303

ASEA PLANS ENTRY INTO JAPANESE ROBOT MARKET

Stockholm SVENSKA DAGBLADET in Swedish 2 Jun 82 p 27

[Article by Lennart Utterstrom]

[Text] The Swedish industrial robot manufacturer Asea is planning an invasion of Japan. This was stated by the large Japanese newspaper ASAHI SHIMBUN in a front page article. According to the newspaper, this could result in a robot war in the "promised land" of industrial robots.

It is not without newly awakened astonishment that Japan's Industrial Robot Association views its Swedish competitor who now plans to capture part of its market and also begin local production of high-quality robots in the mid-price range.

The manufacturers in Japan are "extremely concerned for the Swedes, since no on believes that Sweden can sell industrial robots in Japan in the foreseeable future . . . ," wrote ASAHI SHIMBUN which has a daily circulation of about 11 million.

Unknown Partner

Asea's plans, which have been known for some time in Swedish industrial circles, include a first stage in which Swedish manufactured robots would be sold and a later stage with local production in cooperation with a Japanese partner. It has not yet been revealed which company intends to cooperate with the Swedes--to the great disappointment of the Industrial Robot Association. The concern and curiosity now have gone so far that an American detective firm has been hired to discover the identity of the mysterious partner!

While Japanese robot manufacturers beat their breasts and claim that they produce more artificial workers than any other country, they also express a certain amount of genuine admiration for the Swedish company. ASAHI SHIMBUN goes a step further and writes " . . . we must admit that Asea's robots are extremely advanced and skillful. They are not just strong . . . they also are capable of accomplishing more tasks than a corresponding Japanese robot . . . "

The newspaper also quotes Uedasan, head of Asea's local industrial robot division. He stated proudly that "Sweden is the top producer of robots. Many Japanese products imitate us, but we are best with regard to both intelligence and strength . . . "

Site Already Purchased

If the American private detectives fail to solve the mystery before mi-June, they will have a difficult time justifying their fee. Since early April a small Swedish delegation has been negotiating a contract that will be made public in June. An industrial site already has been purchased in the Kansai region--Osaka-Kobe-Kyoto--and within 2 years a factory will be built, initially for assembly only, but later for complete production.

While Asea is the largest industrial robot in Europe, Japan has been the world's largest manufacturer for just over 3 years. There are a total of about 150 companies in the business--most of them small, but several industrial giants such as Kawasaki Heavy Ind., Hitachi, and Yasukawa also have entered the picture.

During the past year, competition for both the domestic and the export market has increased in intensity. Accusations and counteraccusations concerning dumping often are heard. Now the efforts of a foreign company to enter the Japanese market, a company with admittedly better products, are the cause of general concern. If the rumor is correct that a large American company plans to enter the Japanese market within a year or so, it is probable that many small Japanese manufacturers must start looking around for new products.

One Yasukawa executive stated with concern, "We are worried and want to know what prices the Swedes will ask and which Japanese firm they will work with."

"We must now develop our own robots and also reduce costs. This is the only way to compete," said Yoshino Komori, secretary of the Industrial Robot Association.

9336
CSO: 3102/323

BRIEFS

AEROSPATIALE, TMI TECHNOLOGY TRANSFER--Aerospatiale's production research department has designed and developed a fluid-blast punching machine for composite materials, featuring digital control, as part of its technological research program. Because of the technical and economic appeal of this procedure and the good performances of the equipment, TMI [Technical and Industrial Mechanics Company] wanted to purchase the construction and marketing rights for this device. Mr Millara, Aerospatiale's vice president for industrial and technical affairs, and Mr Vitrat, president of TMI, on 6 April 1982 signed a licensing agreement giving the French firm, TMI, which is well known in machine tools, the right to put on the international market a device meeting the needs created by the growing use of composite materials. The agreement will also give Aerospatiale a substantial profit, helping to offset its spending on technological development. [Text] [Paris AFP SCIENCES in French 15 Apr 82 p 38] 7679

CSO: 3102/293

FRANCE'S STRATEGY FOR ELECTRONICS INDUSTRY ANALYZED

Paris L'USINE NOUVELLE in French 20 May 82 p 214

[Article by Robert Clarke]

[Text] The report of the "electronics mission" headed by Abel Farnoux, who is now deputy director of France Cables, has just been partially released. This is a greatly abridged version (the entire report takes up about 10 thick volumes) which was presented officially within the last few days. This is the nth plan to revitalize our sagging French electronics industry, which has been chasing its own shadow for nearly 30 years now.

The Farnoux plan, an ambitious proposal based on an overall strategy and backed by political determination, will be considered by the council of ministers over the next few weeks. It already seems to have the support of the ministers of research, posts and telecommunications, and industry. The unique feature of this plan is its determination to advance in all directions at once, by means of "national projects" bringing together the private, nationalized, and public sectors, scientists and businessmen, users and union members.

The intent is to bring France closer to the two giants of the electronics industry, the United States and Japan, by doubling the French market between now and 1990, by increasing research by 50 percent, restructuring the development program, and bringing together the maximum number of people of good will, under the guidance of strong project leaders handling boldly innovative programs in all areas, from components up to products with a mass public appeal.

The Farnoux plan will rely on a major manpower effort; over a 3-year period, it calls for training about 1,000 top-level engineers, 10,000 additional technicians, and establishing new advanced electronics schools which would combine data processing, office automation, and automation. One of these schools could develop around the present INRIA [National Institute of

Data Processing and Automation Research] at Rocquencourt, another at the LAAS [Automation and Systems Analysis Laboratory] in Toulouse and the IMAG [expansion unknown] in Grenoble.

To guide this new system, and instill in it a political focus, the report suggests the establishment of a secretariat of state for electronics. The socialist plan was even more ambitious: it called for a ministry of information and communications, which would have had responsibility, in addition to the PTT [Posts and Telecommunications], for the entire data processing and audiovisual industry. In the records of the socialism and industry colloquium held in 1980 there can be seen the themes of a struggle against domination by the multinationals and support for French mastery of basic technologies.

This is what the Gaullists wanted in 1966, when they tried the Computer Plan operation, after the annoyance of the United States' refusal to deliver to France a powerful computer which was to be used to help develop a hydrogen bomb. Once again, military research was the point of departure for an operation destined to create a large national computer industry in France. The advocates of this plan imagined scientists, industry, and bureaucrats all working together. Between 1966 and 1974, the government spent 1.8 billion francs on data processing, but industrial rivalries and the lack of any clear political determination caused this grandiose plan to partially abort.

It wasn't a CII-Honeywell-Bull alliance, the pet project of Michel d'Ornano, that would reestablish the independence of the French information industry; a European solution had collapsed, and French industry was unable to make use of the government's somewhat confused intentions in this area. The major problem was that the strategy was one thing after another. They were trying to develop a "national" computer without a components industry. They had to improvise, trying a number of "components plans," in an attempt to regain terrain that had been won much earlier by the Americans or the Japanese.

The existence of nationalized companies which have real possibilities of playing a coordinating role in the field of electronics now gives the socialist government a new chance of succeeding in what had always failed before. The alliance of Thomson and the research centers of the PTT and of the former ORTF [French Radio-and Television Office], like the one in Rennes, may become a reality, while such an occurrence was unthinkable earlier. It still remains to be seen whether this government prompting will be followed in any effective way by

the rest of private industry and if a really national movement will be enough to attract European partners. For who could imagine any true competition with the United States and Japan unless on a European scale?

We should not have too many illusions: this ambition is going to be very expensive. It took the Japanese a lot of money to compete with American industry. The Farnoux report is counting on the synergy created by the protagonists involved and on a commercial recovery in order to provide the 10 billion francs needed without too much hardship. A meeting is to be held within the next few weeks at the INRIA headquarters in Rocquencourt, bringing together the future partners in this new version of France's electronics ambition. They should be encouraged by the government's affirmation of the top-level interest being shown in this effort, in terms of both manpower and financing. It isn't so much a matter of getting ahead of Germany and replacing it as the "third big name" in electronics, but rather of moving ahead and coming closer (with our European partners) to the United States or Japan than we are now.

The issue is a vital one, and the ambition is something to take pride in. It does remain to be seen if we will be able to handle this policy promoting development in all areas at once. It is a matter of choices that must be made. One more choice...

7679
CSO: 3102/311

STELTZER ENGINE HAS ONLY ONE MOVING PART

Stockholm NY TEKNIK in Swedish 20 May 82 pp 18-19

[Article by Fredrik Asklof]

[Text] As few moving parts as possible.

This is the main concept of a new type of engine developed by a German inventor.

The engine consists of only eight parts. Only one of these moves.

Frank Steltzer of Frankfurt has worked on his invention for 20 years. He plans to revolutionize engine construction with his "engine without mechanics."

"I will not quit until all conventional piston engines are past history," he said.

Actually, however, Steltzer's engine is not a new invention. A Spanish engineer was granted a basic patent on a so-called free-piston engine as early as 1934 and Frank Steltzer has developed this idea.

The free-piston engine already is used today in gas generators in turbine-driven ships, for example.

In addition to the small number of parts, the Steltzer motor is characterized by the stepped piston, the only moving part, whose ends extend outside the engine block. This is possible because the two combustion chambers are located between the two ends of the piston. For this reason, the free ends of the piston may be used directly as working pistons in a compressor.

The design also permits the use of a hollow piston which may be used as a pump. A third possibility is for the piston to drive a linear generator, a generator that goes back and forth rather than spinning around.

Considerably Cheaper

Because of its simple design, the Steltzer engine will be considerably cheaper to manufacture than conventional Otto-cycle and diesel engines, according to the inventor.

Since the engine has only one moving part which is subjected to no radial load other than the dead weight of the piston, wear will be low, resulting in a long lifetime and low maintenance costs.

The absence of moving parts also will reduce fuel consumption. Fuel consumption will be 30 to 50 percent lower than in a conventional combustion engine, according to Steltzer.

Several types of fuel or fuel mixtures can be used, for example gasoline, methanol, diesel fuel, or kerosene, although tests with methanol have not yet been conducted.

Extremely Low Vibrations

Another characteristic of this engine is its low operating temperature of about 80°C and the extremely low vibrations. According to the inventor, the engine operates more evenly the higher its frequency. The frequency of the piston is limited by the piston rings.

With the molybdenum-coated rings used today, the limit is about 20,000 strokes per minute.

It is hoped that with ceramic pistons the frequency, and therefore the power, could be increased considerably.

The prototype engine shown at the automobile exhibition in Frankfurt last year and at the Hannover exhibition this year has a piston diameter of 140 mm and a stroke length of 40 mm. At 5,000 strokes per minute it has a power output of 74 kW (100 hp).

According to Steltzer's calculations, this power would be doubled at 12,000 strokes per minute. It has not been possible to increase the frequency of this engine, however, but a smaller engine has reached 20,000 strokes per minute.

Large and Small

The design is suited to both small and large engines, from 20 kW (27 hp) to over 750 kW (1,000 hp).

What does the future look like for Frank Steltzer and his engine? Interest seems to be high in the areas of compressors, generators, and especially pumps.

In September last year Steltzer founded a company in which various interests may purchase shares. The goal is to accumulate just over 23 million DM (just under 60 million kronor) for independent development of the concept. By February of this year about 100 interested parties had invested about

9 million DM.

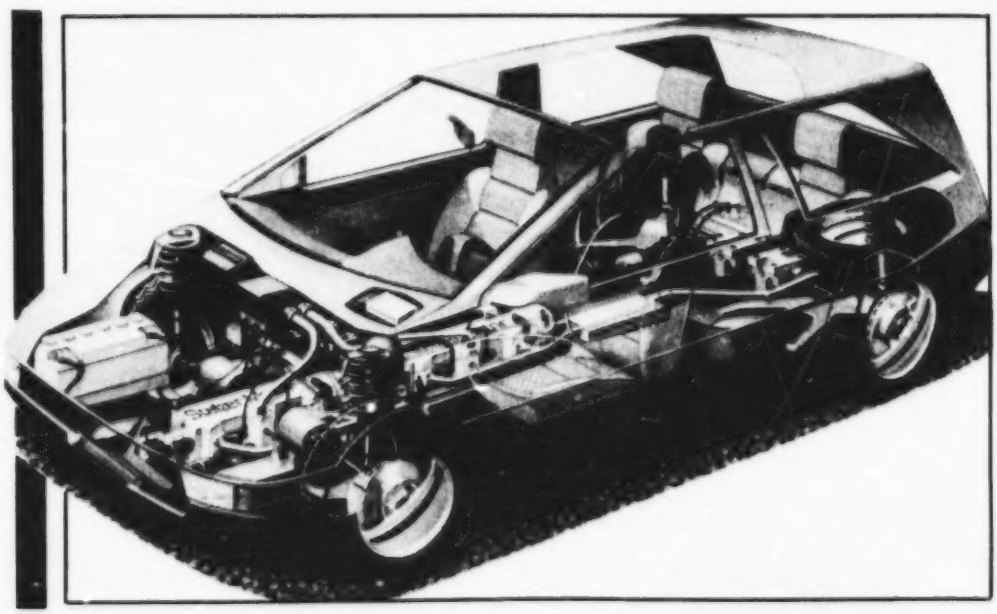
In Ireland Steltzer Motor Ireland Ltd. has been formed. The Irish government has promised to pay 60 percent of the production costs for pump motors.

It is also hoped that money for continued development will come from license sales to Arab countries. Steltzer's company will concentrate on producing engines suitable for series production and concepts for automobile propulsion.

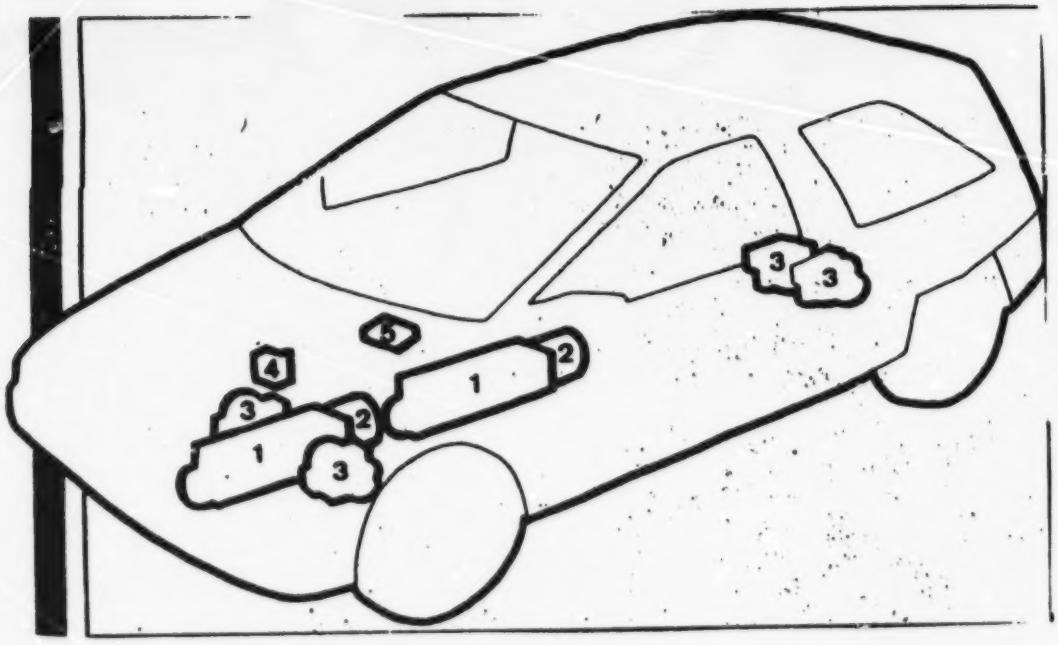
Frank Steltzer and his coworkers still have much to do, however. So far they have not had an engine in continuous operation under realistic conditions and, thus, experience in long-term operation is still lacking.

The engine also must be improved to reduce exhaust emissions and noise.

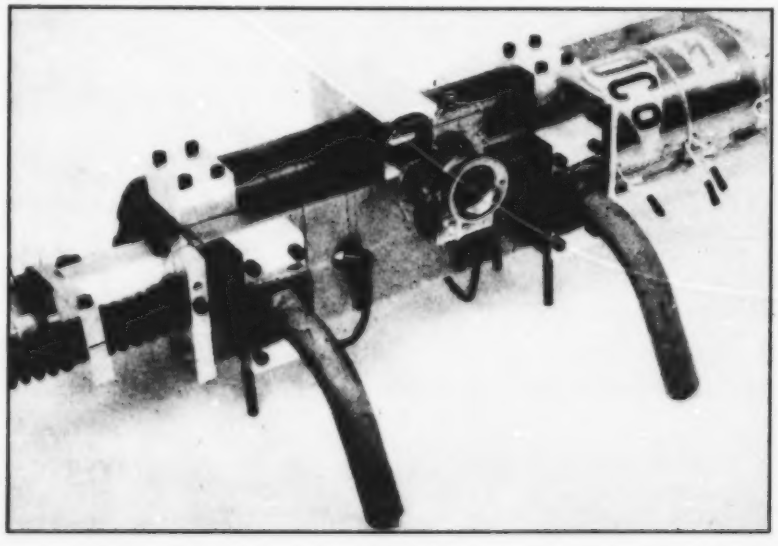
Despite these difficulties, Steltzer believes that the first Steltzer automobile will be on the road before 1985.



The first Steltzer automobile may look something like this. Little space is needed under the hood, since two long, narrow engines are mounted under the floor of the passenger compartment.

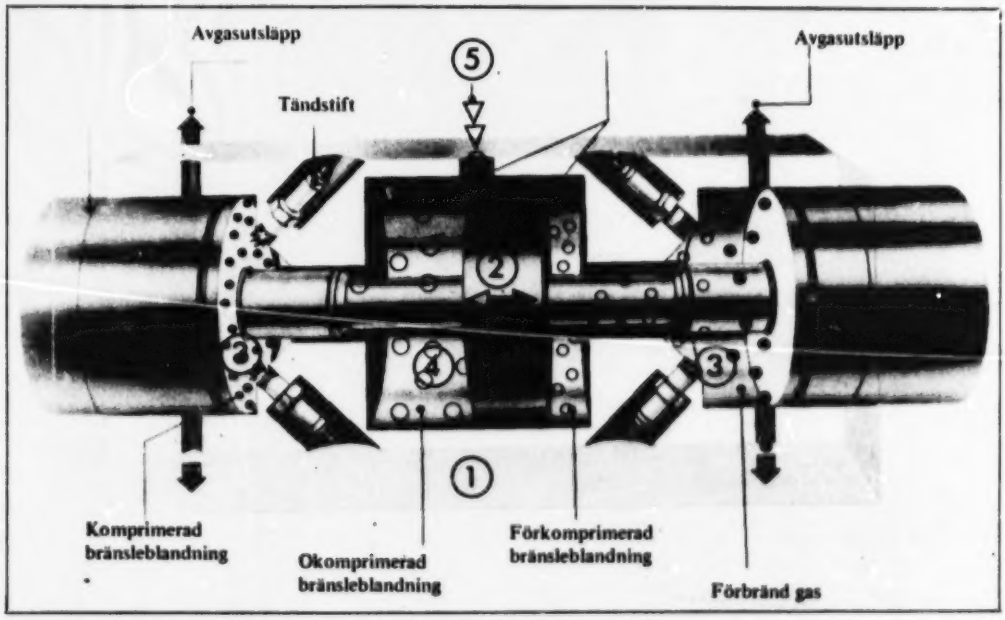


The car is designed in the following way: (1) engines that drive the generators (2) which, in turn, drive electric motors (3) located near each wheel. The computers (4) and (5) control the engines and the transmission of electric power.



A complete engine. The carburetor is in the middle. The two pipes are for the exhaust. The part on the far right is a linear generator. Mechanical power transmission is difficult, so the engine will be connected to a generator or a hydraulic motor.

(A) (B) (A)



(C) (D) (G) (F)

The engine, which is a two-stroke three-piston engine, consists of eight parts. Seven of these for the engine block (1) and the remaining part is the stepped piston (2). The engine block contains two combustion chambers (3) and a compression chamber (4). As in a conventional two-stroke engine the fuel-air mixture is drawn from the carburetor (5) (or injection pump) into the compression chamber. The fuel mixture then is compressed (when the piston returns), after which it is allowed to pass into the combustion chamber while the burned gas is forced out at the same time. At the same time, the fuel mixture is drawn into the other half of the engine. When the fuel mixture is ignited the piston is pushed in the other direction and more fuel mixture is drawn in and the process repeats itself. In this way a linear oscillating piston movement arises in which the compressed gas acts as a shock absorber for the rapidly oscillating piston. The ignition system is magnetic and each combustion chamber is provided with two spark plugs for more rapid and even combustion. The frequency is regulated by the fuel supply. The higher the frequency, the higher the compression and, therefore the greater the power.

Key to figure:

A Exhaust

B Spark plug

C Compressed fuel mixture

D Uncompressed fuel mixture

E Precompressed fuel mixture

F Burnt fuel

9336
CSO: 3102/350

WORLD'S LARGEST SAIL-POWERED-VESSEL PROJECT

Stockholm NY TEKNIK in Swedish 29 Apr 82 pp 36-37

[Article by Christer Larsson]

[Text] With advanced technical design and a highly automated rigging system, a new age of sailing vessels could begin during the 1990's--assuming that the relatively high costs of bunker oil continue.

At least this is the hope of Lennart Apelstrand of Navire Cargo Gear, NCG, of Goteborg who, along with colleagues at the large Belgian Cockerill Shipyard, is involved in the world's largest sailing vessel project--the SBC-1. So far the project is still on the drawing board. But the wind is shifting in favor of the sailing vessel, according to the project leadership.

The EC Energy Commission in Brussels is aware of this change of wind and is helping finance the first stages of the project.

For over 2 years Lennard Apelstrand and his colleagues at NCG in Goteborg and Cockerill in Belgium quietly have made detailed studies for the totally new systems that must be developed for a modern sailing vessel of 30,000 dead weight tons.

With five masts and 12,160 square meters of sails, it will plow through the waves of the Atlantic between Europe and the east coast of the United States. The computer programs on the fourth floor of the NCG building on Gustaf Dalensgatan in Goteborg have calculated that it will do well over 20 knots at a wind velocity of Beaufort 9, i.e. 21 to 25 m/s or strong gale.

The estimated average speed is 12 knots for the round trip by sail alone. This is wholly acceptable, even for most machine-driven cargo carriers today.

Low-Economy Speed

Because of high bunker costs, motor vessels are forced to operate at low-economy speeds. Each extra knot may be the difference between profits and losses.

This year began with rock-bottom cargo prices. A shipment of wheat from the

United States to the Soviet Union on a 30,000-ton vessel yields 2,500 to 2,700 dollars per day for the shipping line. Such a load would be profitable under a Liberian flag, but would cover only 55 percent of the crew costs under Swedish flag, according to the Association of Shipowners. On the tanker market a quarter-million-ton vessel makes only 80 percent of its bunker costs when it sails at low-economy speeds. Today many shipowners must pay to ship cargo.

"Every cent OPEC adds to oil prices in the future brings us closer to a new epoch in commercial sailing vessels," Lennart Apelstrand said as he tapped one of the thick folders of the SBC study. The cost estimates are unequivocal when it comes to the competitive strength of the projected sailing vessel. The figures are confidential."

Fairway Buoy

"But they are highly reliable," Lennart Apelstrand said as he took a blueprint from one of the folders. It is a general plan showing the perspective of the ship. A modern 8-meter cruising yacht is drawn in for comparison. It looks like a fairway buoy astern of the enormous hull of the sailing vessel. It gives some indication of the proportions. It also says something about the task facing NCG which is responsible for all the enormous rigging equipment including sails, masts, and yards and the heavy, computer-controlled hydraulic system that will maneuver the rigging.

"Of course we have experts on navigation in our company, but in this case we have entered uncharted waters," Lennart Apelstrand admitted.

With 25 years of experience, NCG has developed into one of the world's leading companies in the development of loading platforms and cargo hatches. The company controls 30 percent of the world market and is represented by 11 subsidiaries, 6 companies under license, and 5 agencies in all parts of the world. The main office is in Goteborg, but the company is wholly owned by the Finnish Kone group.

Special Equipment

By specializing in platforms and hatches, NCG also has gained expertise in heavy hydraulics. That was the decisive factor when the company was asked to enter this dormant sector of navigation.

"We had manufactured some special equipment that the Belgians considered advanced. They then began to speak of their plan for a large, modern cargo-carrying vessel and the need for heavy hydraulic systems for the rigging. We were surprised when asked if we would be interested in conducting preliminary studies for a sailing vessel!

The basic concepts and most of the resources were at Cockerill. Some of the funds came from EC.

The Soviet Union also says it is interested in the future of large ocean-going cargo sailing vessels. Several preliminary conferences have been held on the subject, but the step from word to deed usually is a long one.

"Of course we feel like pioneers. If we did not believe seriously in the future of sailing vessels we would not be involved in a project of this type. I am convinced that the Japanese are on the right track," Lennart Apelstrand.

He returned again and again to the serious cost problem and oil prices that are forcing modern shipping to reexamine the entire field.

"Not even we believe that modern sailing vessels will put machine-driven vessels out of business. We do believe, however, that sailing vessels will be competitive, if not to say superior, for ocean trafic with so-called low-grade cargo such as wheat and coal and possibly oil.

The shipping industry is conservative by tradition, but navigation also is used to rapid changes. In Sweden today commercial shipping has been reduced to the same level of tonnage as in 1962. Since that year 10,000 jobs related to shipping have disappeared.

The shipping companies and the Seamen's Union are talking about saving the remaining 15,000 jobs in the industry by registering ships under flags of convenience or by classifying for tax purposes crew members on ships sailing abroad as Swedes living abroad.

Then a small multinational engineering firm in Goteborg enters the picture with a completely new dimension.

In one folder with preliminary studies Lennart Apelstrand located the still confidential patent drawings of the system that will maneuver the 12,160 square meters of sail across the Atlantic in all types of weather. The system was developed in a computer using the ship's specifications and weather conditions in the Atlantic.

But the product resulting from the work at computer terminals, on drawing boards- and at desks contains a number of technical pitfalls.

How will the problem of tolerance be solved and how will sails be changed? How many units must be doubled? How long should it take to reef the sails?

"One of our most difficult problems is the safety issue. In the old full-rigged ships the sails could be blown away if the wind was extremely strong. There must also be some weak links in a modern ship rigging. But what are the optimum values?"

Some of these questions will be answered when the English sailmakers complete the first set of sails made of new synthetic materials. Other answers will come when a full-scale prototype mast is raised onboard a commercial vessel that crosses the Atlantic which has promised to participate in the studies.

Later, if the project goes to completion, a relatively large-scale prototype will be constructed.

Computer Watches Masts

With a strong wind and all sails set the SBC-1--the sailing cargo ship--will pass most other sailing vessels between Vinga and Anholt some fine but windy summer day.

That is if it ever becomes reality and if its 12,160 square meters of sails ever should appear in Kattegatt. If this ever happens it would be a good idea to get out of the way. Traveling at over 20 knots by sail alone, with a length of 167.5 m, a width of 27 m, and a draft of 11.4 m the surge would be considerable. On the leeward side there probably would be no wind at all.

It is estimated that a crew of 27 would be required and their job would be, among other things, to maneuver and maintain the hydraulic system and machines that would be responsible for raising and lowering the enormous sails.

Unbraced Masts

The masts will be completely unbraced and the stress in various mast sections controlled by computers. There will be no need for sheets. Instead, the masts and yards will be turned by powerful steering machines.

Each mast will have 10 sails that may be reefed two at a time. Several systems in the rigging will be maneuvered totally automatically by computer programs.

Normally, no crew members will have to climb a mast. All maneuvering will be done from the deck.

Calculations have been made for various compositions and alloys for masts that will extend 91 meters above the tank top plating and 85 meters above the surface of the water. It is estimated that at deck level where the stress will be greatest the diameter of the masts will be 3 meters, while at the top it will be 1.2 meters. Work is underway to reduce these dimensions, if possible.

High Stress

Because of the amount of material required for the masts, high-strength steel is the only possibility from a cost standpoint. The stresses will be considerable when the Atlantic wind tests the strength of the masts. The SBC-1 will be able to beat much better than old sailing vessels--up to 60 degrees from the eye of the wind--and the sails will remain in place even when the wind rises.

An auxiliary motor and a propeller that can be moved in and out of the hull will assist the ship when it enters a port.
It is estimated that the maximum roll of the ship will be 10 degrees. That, if nothing else, could mean that life onboard would be unusually pleasant.

9336
CSO: 3102/323

END

JPRS 81340

22 July 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 112

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JPRS 81340

22 July 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

No. 112

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BIOTECHNOLOGY

DUTCH GENETIC ENGINEERS WORK ON PLANT BREEDING

Amsterdam ELSEVIERS WEEKBLAD in Dutch 5 Jun 82 p 9

[Article by Joop Berger]

[Text] The tomato plant is a self-fertilizer. Plant improvers find that annoying because that makes it difficult for them to cross-breed different tomato varieties. The petunia and genetic engineering may perhaps provide a result.

Although the use of concepts such as superplants appears premature, it is, indeed, clear that those who tinker with heredity have found fertile soil also in agriculture. Trade and industry appear very interested.

Enterprising financiers have lately shown a growing interest in a new, interesting investment object: plant biotechnology. In the United States, brand-new enterprises are able to attract much money for research aimed at the manipulation of hereditary properties in cultivated plants. Prospects of spectacular products are, indeed, also held out, such as the tomato-'pomato' and the 'sunbean.' The tomato-'pomato' would be a superior potato in which a few properties of the tomato have been incorporated. These properties of the tomato plant would make the potato plant insusceptible to certain diseases. When the sunbean is, indeed, introduced on the market, the growers will have at their disposal a plant which possesses the combined properties of the sunflower and the white bean. The hereditary substance (DNA) of the sunflower takes care of the production of oil and protein, the DNA of the white bean stimulates the making of extra protein.

Also the established food industry takes an increasing interest in the possibilities of genetic engineering in respect of plants. The U.S. giant soup manufacturer, the Campbell Soup Company, recently invested 10 million dollars in a project which, among other things, is expected to furnish a tomato plant with genes of the tobacco plant. In the United States and in Western Europe, a number of universities and government institutions are busy improving cultivated plants at a genetic level. They have mainly arrived at this along the road of basic research into the heredity of plants and the working of the plant cell.

Also the Netherlands belongs to this group. In Wageningen, Professor, Dr. B. de Groot of the ITAL Foundation, together with 9 scientific coworkers, will before

long start a research program which is expected eventually to result in an improved version of the 'bintje' [a potato variety; translator]. This economically important potato variety may, for the time being, be brought to good production only by means of an extended spraying program. Some potato varieties are by nature resistant to the diseases against which the 'bintje' has to be protected by means of costly pesticides. The researchers of ITAL will attempt to transfer to the 'bintje' the pieces of DNA which in these varieties provide the resistance to diseases.

In Wageningen, a group of biochemists, under the leadership of Professor, Dr. R. A. Schilperoort, are examining the possibility of incorporating in plants the ability to form nitrogen compounds. Such plants would need less or no nitrogen fertilizers for their growth.

The Department of Genetics at the Free University of Amsterdam is going to carry out a project in cooperation with the Institute of Plant Improvement at Wageningen which is expected to provide an improved tomato variety.

Selective

The adaptation of plants to the desires of man is nothing new today. Already for thousands of years, man has been trying, through selection, to grow plant varieties with new favorable properties. During the last 150 years this has taken place through selective hybridization. Not a single cultivated plant, therefore, is still identical to its remote ancestors. The species of wheat now standing in fields differ enormously from the original wild wheat. Their yield, for example, is twenty times as high.

Impressive results have been attained by means of the classical methods of plant improvement. These methods, however, have their limitations. Through cross-breeding, only variants of the same species or of related species may be combined. Through newly developed techniques from the laboratories of molecular biologists and biochemists, the possibilities of combinations may now be considerably widened. One of these techniques is the so-called fusion of protoplasts.

Protoplasts are cells which have become removed from their cell wall. When the cell wall is dissolved, an insurmountable barrier disappears, and the cells of two different plant species may become fused. Thereby, the genetic substance of both cell nuclei also becomes mixed. The cooperating researchers of the Department of Genetics of the Free University of Amsterdam and of the Institute of Plant Improvement will be making use of this technique.

Dual Purpose

Professor, Dr. H. J. J. Nijkamp of the Department of Genetics: "Our research has a dual purpose. In the first place, we want to increase our knowledge of a quality which occurs in a few plant species and which is called male sterility. In the second place, we shall try to incorporate this property of male sterility into the tomato plant which does not possess this property by nature."

"The existing commercial tomato varieties are all hybrids: varieties arise from the cross-breeding of existing varieties, the favorable properties of which one has combined. However, such hybridization between different tomato varieties does not take place spontaneously. The tomato plant is a plant which fertilizes itself. The stamen of the tomato plant produce pollen which end up on the pistil of the same plant and there lead to seed-formation. In that way, a combination of desired genetic properties of different varieties cannot take place. In order to cross-breed a tomato variety with another variety, one could remove the stamen from one of the two varieties. That may be done in the case of a few plants, but in the case of an entire field, this would be much too labor-intensive. It, therefore, would be extremely nice if we could make the male stamen of that tomato plant infertile or sterile, so that non self-fertilization takes place."

"We shall now try this by means of the petunia. This ornamental plant possesses by nature the property of male sterility, and that property probably lies in the mitochondria, small organs in the plant cell. By means of protoplast fusion, we shall try to fuse the cells of the tomato plant with those of the petunia, so that tomato cells with petunia mitochondria arise. In special soils, we shall then grow the cells into tomato plants. We then hope that the plants will carry the property of male sterility in their genetic structure."

Resistance

The fusion of tomato and petunia protoplasts should in this study thus provide a tomato variety which has lost its ability of fertilization and thereby, of itself, switches to cross-pollination. Protoplast fusion is also used to protect plants against diseases. That happens in the research program in which the Campbell Soup Company has invested $10 million. For its cans of soup, Campbell has got enormous fields of tomato plants in California. In order to keep these plants free of diseases, the company spends much money on pesticides. A tomato variety with a built-in disease resistance would be extremely attractive from an economic point of view. That is why researchers at Campbell try to tranafer the natural disease resistance which is present in the tobacco plant to the tomato plant by means of protoplast fusion.

In theory, the new biotechnological methods make it possible to develop plants which are resistant to diseases, which thrive in a soil with a high salt content, or which are content with poor soil and a dry climate. It also appears possible to stimulate plants to produce the same yields at lower temperatures. That would result in considerable energy savings in greenhouses. The expectations, therefore, are also high, in the food industry as well as in scientific circles. That has led, among other things, to enthusiastic reports in the press on a possible definitive solution to the world food problem thanks to the new "superplants." Will genetic engineering manage to come up to these high expectations or will vast disillusionment follow shortly?

The possibilities of biotechnology are not unlimited. The less related the plants are of which one wants to combine the genetic substance, the greater is the chance that the hereditary mass of the different species will not tolerate each other.

Rejection may take place, as also happens in the case of transplantation of human organs. But even when, for example, a protoplast fusion has been achieved, numerous obstacles still remain to be overcome. Finally, there is, moreover, the time-consuming process of testing in the field or in the greenhouse. A plant which is a success in the laboratory may be a total failure in the field.

On account of all the problems associated with plant improvement by means of genetic engineering, many Dutch researchers assume a somewhat cautious attitude when asked about the possible future applications. In any case, more cautious than some foreign colleagues who already see commercial applications within a few years. A combination of the complete hereditary material from two totally different plant species is, according to the Dutch researchers, only interesting to basic research. It will never provide anything really useful. However, they do believe that the transfer of a few properties from one plant to the other in the course of 10 to 15 years may lead to new commercial cultivated plants.

Professor Nijkamp: "Among the classical plant improvers, you will find critics who do not believe in the new developments. If they find that there is still a lot of work to be done, then they are, of course, right. If they say that the expectations are rather high, then they probably are right as well. The molecular biologist is often somewhat overly enthusiastic about the developments in the area of genetic engineering. He actually then forgets that classical plant improvement has been enormously important and will remain so also in the future."

Supplement

"We must view the new methods in the area of tinkering with heredity as an interesting and important supplement to developments which have already taken place in the area of plant improvement," says Nijkamp. He points out, on the other hand, that we must not be so critical with regard to the possibilities which molecular biology offers that we retard developments.

"Everything in this area goes somewhat slowly," says Nijkamp. "Everything, so far, happens on a too small scale and in ad hoc cooperative arrangements. However, one seems to become awake also in this area. Recently, a report appeared from the Biotechnology Program Commission. That report also clearly embraces plant biotechnology. There is also an increasing cooperation among the classical plant improvers and the molecular biologists via the Agricultural Genetic Engineering Commission. I hope that this tendency will continue. The Netherlands has always had a good name in the area of agriculture. In order not to lose our leading position, we must, at least, keep up with the new developments."

7262
CSO: 3102/324

FRENCH EFFORT IN BIOTECHNOLOGY INCREASING

Paris LE FIGARO in French 26 Oct 81 p 16

[Article by Jean Baudot]

[Text] Toulouse--Following the craze of leading American companies over industrial applications of "genetic tinkering," the French industrial world has also launched out on this future path with the establishment of Transgene and Genetika.

The international conference held in Toulouse from 20 to 22 October made it possible to assess the future of such applications in France.

In a speech delivered at the start of the conference, Mr Jean-Pierre Chevenement, minister for research and industry, outlined the major features of the new administration's policy in this regard: increased financing, the establishment of its own or associated laboratories, higher quotas of engineers. Moreover, the minister seemed to want to modify the criteria for judging the work of research teams, in which case consideration will be given preferentially to the number of licenses granted to industry and no longer just to the quality of scientific publications.

A New Calling for Regions

The industrial world involved in biotechnological programs (ELF [Gasoline and Lubricants Company of France]-Aquitaine, Rhone Poulenc, Institut Merieux ...) has also been able to compare with research officials (Pasteur Institute, National Institute of Applied Sciences ...) different views on the most interesting areas of research: inhibitory enzymes, hybridomes, all-inclusive research on new properties (screening), synthetic vaccines.

It was not by chance that such a conference was held in Toulouse. The Midi-Pyrenees metropolis, which has a great potential for research and training in microbiology and cellular genetics, is actually seeing a new calling emerging for it with biotechnology, after aeronautics, space technology and electronics. One of four centers for the transfer of French biotechnology will open next year, intended to bring together researchers and industrialists for developing and perfecting new production processes. Toulouse has also been selected by Bio-Elf as the site for its first European biotechnology laboratory, where

70 researchers will be employed starting in 1983, conducting research on seed improvement in particular.

It is also in this region that an exemplary "biotechnological PMI" [small and medium-size industries] (Setric) has been developed, working in the areas of both organism production and training materials and whose success has led two "giants" (ELF-Aquitaine and Moet-Hennessy) to acquire stock in subsidiaries.

11915
CSO: 3102/304

'BIOTECHNOLOGY MISSION' TO COORDINATE FRENCH RESEARCH, DEVELOPMENT

Paris LE MONDE in French 28 Oct 81 p 12

[Article by Maurice Arvonny]

> [Text] One of the first decisions by the minister for research and technology, Mr Jean-Pierre Chevenement, was to create six missions covering research sectors in which he considered urgent action was necessary. The first to begin operating is the biotechnology mission, whose chairmanship has been assigned to Mr Pierre Douzou. A member of the Institute and an expert in low-temperature biology, Mr Douzou has also been life sciences director for the General Delegation for Scientific and Technical Research (DGRST) and was thus already involved in the sector covered by the mission.

How is this mission organized? What are its structures? What will its program be? For the time being, Mr Douzou has set up a light structure; three sectoral officials, Messrs Philippe Kourilsky, Gilbert Durand and Gerard Siclet, are respectively in charge of basic research, transfer research and bioindustrial research. They rely on the advice of a committee of 11 experts who simultaneously represent all research centers and all disciplines involved. The committee has already met twice and its role is to coordinate and evaluate the research. Correspondents also provide links with different ministries, so that research policy can be adapted to the strategies of ministerial departments. A national biotechnology committee, chaired by the minister for research and technology, should be established early next year; it will determine the strategy to be followed in the area of biotechnology, with the mission then becoming its secular arm.

The mission has so far been concerned with learning more about the state of research and especially its consistency. French researchers have their strong points, such as genetic engineering, with good university and other laboratories and development centers such as the G3 group and the Transgene company. The situation is not bad either in the case of biochemical engineering (Compiegne, Toulouse) and vegetable cell cultures, in which the National Institute for Agricultural Research has made a serious effort. But the big "hole" is microbiology. The potential which existed several years ago has vanished, since laboratories did not receive critical funding and there is a striking lack of

microbiological stock. Mr Douzou is amazed that France, which is the country of Pasteur and systematics, has so neglected the systematics of microorganisms: The number of recorded species is in the thousands, while nearly a million insect species are known.

And microbiology is the source of all the rest: It is absolutely necessary to acquire a better knowledge of microorganisms, particularly hardy bacteria which proliferate in nature and whose potential could be broadly exploited. In a veritable "praise of putrefaction," Mr Douzou noted that "the layer of dead leaves covering the forest floor in November has disappeared by February. Microorganisms have digested and eliminated it. No one knows exactly what has happened or what products have been synthesized, but some of them could be very useful. Similarly, when a beam rots, it is microorganisms which have transformed the wood. What did they do? An industrial society concentrates and transforms all kinds of materials whose by-products threaten the biosphere: There are definitely microorganisms capable of eliminating them or even improving them." A first priority is to study these decomposition processes, in which thousands of molecules are synthesized, especially since, with the culture medium being wastes, only a single valuable product need be synthesized for such biosynthesis to be economically attractive.

Assuring the consistency of research and "plugging the holes" is one of the primary goals of the mission. Another is the transfer of technology and basic research to industry. This is the reason for the 3-sector division mentioned above. Three transfer centers exist or are in the process of being opened at Compiegne, Toulouse and the Pasteur Institute. They will be the meeting places for researchers, engineers and industrialists. Mr Douzou would like for them to act as a stimulus, although he admits that this will not be easy. Transfer of technology has always been the weak point of French research, which has "a great reservoir of knowledge, but not always of know-how." In the area of biotechnology, the problem is paradoxically heightened by the existence of well-established processes: Wines and cheeses are made according to age-old technology, which serves as a pretext for not conducting research. But, as Mr Douzou noted, "the specificity of French wines depends on the microorganisms proliferating in the casks; anyone can purchase some casks, study the microorganisms and perhaps within a few years, reconstitute equivalent wines." It should be quite apparent that the entire food-agricultural sector could be disrupted without warning as a result of future biotechnological advances. Thus it is important to increase the awareness of producers.

Two other industrial sectors, fine chemicals and pharmaceuticals, which mainly use nonbiological synthesizing processes, could also have their methods disrupted in a few years.

Basic research, the holder of the unforeseeable, must also be broadened. "Ten years ago, no one foresaw the emergence of genetic engineering, which resulted from research that seemed to be of marginal importance," Mr Douzou noted. At the same time that acquired knowledge is being transferred, research must be conducted elsewhere. Finding enzymes that withstand high temperatures--most are destroyed at 40° C.--could have consequences of very great industrial importance.

Final problem: training and information. The national development plan which will result from the proceedings of the national committee will have to provide for budgetary resources: resources for research agencies, research funds for launching new programs, grants from the National Agency for the Valorization of Research (ANVAR) to industrialists. But the biggest problem is training the researchers, engineers and technicians who will develop and apply the different biotechnologies. Links are being established for that purpose with the Ministry of National Education.

The journal POUR LA SCIENCE has just published a special issue on industrial microbiology. Price: 25 francs.

11915
CSO: 3102/304

BRIEFS

OFFICIAL EUROPEAN POSITION ON DNA--Following a detailed analysis, the Economic and Social Committee [CES] of the European Communities adopted, during the plenary session of 15-16 December 1981, its definitive position concerning studies on recombinant deoxyribonucleic acid (DNA). The risks associated with recombinant DNA studies are today considered minor. But the CES believes that it is essential to continue to emphasize risk-evaluation studies; to provide training in microbiological safety; to maintain safety standards to reassure the public; to coordinate current arrangements in member countries in order to simultaneously guarantee fair competition and equal safety conditions. The committee concluded that in the case of genetic research, the European legal instrument for covering such objectives should take the form of a directive. In accordance with the views expressed by national experts during the conference, the committee believes that European directives concerning studies involving the use of pathogens (microorganisms causing illness) should be established. With regard to certain concerns expressed by the public concerning genetic research studies going beyond the area of recombinant DNA, the committee said that it was in favor of an international initiative covering and specifying the moral aspects of genetic technology research. [Text] [Cergy BIO-LA LETTRE DES BIOTECHNOLOGIES in French Jan 82 p 6] 11915

CSO: 3102/304

RIBER TO COMMERCIALIZE FIRST MBE SYSTEM FOR SILICON

Paris ELECTRONIQUE ACTUALITES in French 30 Apr 82 pp 1, 17

[Article by J.-P. Della Mussia]

[Text] Before the end of the year, the French company Riber, which is presently believed to cover approximately 65 percent of the world market for molecular beam epitaxy (MBE) machines, will offer the first commercial development machine of this type specially adapted for silicon.

This laboratory machine, whose specifications have not yet been disclosed, will make it possible to produce silicon components with unparalleled epitaxial precision, and do it at a low temperature (and hence with high production yields). It will also make it possible to create new types of integrated components, and in time, three-dimensional ones. Since 1976, Riber has sold 60 laboratory MBE machines, used for II, VI, or III-V materials, whose epitaxy problems are particularly delicate. In particular, 25 of the company's last MBE 2300 P machines, introduced in 1980, have been sold, mostly in the United States, but also in Japan, where Riber is believed to cover 80 percent of the market.

Starting With Ultra-High Vacuum

Riber has specialized in ultra-high vacuum (up to 1.10-11 torr) for some 15 years; it then developed its activities in all aspects of ultra-high vacuum, particularly gas analyzers, and then in Auger spectrometry and ion microprobes. The MBE activity began in 1976, unexpectedly, following the request from a German firm for an ultra-high vacuum system together with an Auger spectrometer and the capability to evaporate elements. Without knowing it, Riber at that time had all the facilities for making an MBE machine. The company immediately seized the opportunity, and marketed its first system in 1976. The activity acquired some magnitude in 1978, as a result of modifications made to the original system (in particular thanks to Bell Labs comments). The generation for 2- and 3-inch slices (MBE 2300) was introduced in 1980. Today, Riber has become the first in the world, ahead of Varian, Vacuum Generators, and Perkin Elmer. The MBE activity, which grew by 250 percent in 1981 for the company, now represents 48 percent of its total turnover, with 65 percent of the MBE turnover being obtained from exportations. (The actual turnover figure is not disclosed, but in 1981 the company sold 25 MBE machines at a price between one and two million francs). This growth has in fact compelled the company to recently move to Rueil Malmaison.

Toward Industrial Machines

So far, MBE machines remain laboratory (or small batch) models as a result of their output: maximum epitaxial growth rates are of the order of 10 microns/hour per slice. (For instance, an epitaxial layer of 1.2 microns is necessary for an FET, and a 5-6 micron one for a laser). But in practice, all the handling steps in FET production for instance, result in a production limited to three 3-inch wafers in 10 hours (with a machine maintenance every two weeks). A 3-inch wafer, however, can carry 10,000 and more GaAs transistors.

In addition to this capability, the MBE has exceptional features. This is the machine which allowed Bell Labs to obtain the "world's best crystal," with less than 1 percent variation in uniformity, doping, and thickness at the same time. This is also the machine which made it possible to fabricate super-networks, which today are almost certain to supplant Josephson devices in fifth generation computers. And finally, the MBE machine makes it possible to conceive any device structure, even in three dimensions.

Two methods currently exist for industrial epitaxy: liquid phase and vapor phase (CVD, or in the modern version, MO/CVD under partial pressure). The first method consists of flowing a liquid over the surface on which an epitaxial layer is to be grown, and lowering the temperature. But it works only over an area of a few square centimeters, does not result in good thickness uniformity, and precludes very thin deposits. It is nevertheless used in laser fabrication because it leads to good performances. Its low cost is compensated by the need to work in clean rooms.

Vapor phase epitaxy uses the decomposition of organometallic gases in a controlled atmosphere. It produces good results, and the technology is familiar. In particular, it does not require ultra-high vacuum. But the basic materials, which have poor storage characteristics, are made only in the United States for GaAs, and are expensive. Neither very thin layers nor selective epitaxy can be obtained with this method.

MBE, on the other hand, uses selective evaporation in ultra-high vacuum from several heated crucibles containing the materials to be incorporated in the deposited layer. The temperature of the substrate determines the crystallization. The crystallographic structure can thus be monitored during growth, and the dopant concentrations can be very precise since they are controlled by the crucible temperature. In addition, very complex structures can thus be created: a shutter, for instance, can instantly stop the doping, and any concentration profile can thus be obtained. That is why some have said that "the only limit for MBE is the imagination of the researchers."

We might also add that this method is the one which allows the use of the lowest substrate temperatures, and therefore the best fabrication yields.

Riber is now specializing in this advanced technology; a collaboration with Thomson-CSF's LCR, particularly as part of DRET contracts, has enabled it to perfect the characteristics of the various machines.

(The concrete success of such DRET laboratory/industry joint actions should in fact be emphasized).

So far, Hitachi and IBM are making the best industrial use of MBE, but Bell Labs are conducting the most advanced research.

Riber is presently attempting to define the future needs for an industrial MBE machine which would be marketed around 1983-1984.

Great Hopes for Silicon

MBE is also a great hope for silicon epitaxy because of the control it allows over thickness, doping, and crystallography. Research in this area has been conducted for 4-5 years. Riber has already begun to modify its machines for this purpose, and in fact has supplied a non-standard installation to IBM. Bell Labs has been working actively on this topic, and CNET (National Center for Telecms Studies) in Grenoble has just begun. An industrial outlet could be created when a machine with a capability of the order of 10 slices/hour makes its appearance, an event which will undoubtedly require at least another 2-3 years.

CAPTION:

This epitaxy machine, with some modifications, will probably make it possible to achieve the first three-dimensional integrated circuits in coming months. It is made by Riber in France.

11,023
CSO: 3102/278

BUDGET, ACTIVITIES, FUTURE OF INRIA OUTLINED

Paris ZERO UN INFORMATIQUE HEBDO in French 26 Apr 82 p 17

[Article by Jean-Louis Cousin]

[Text] After some problems in getting started in 1980, the INRIA [National Information and Automation Research Institute] has managed to shift into second gear in 1981, when, during the second quarter, it got a very welcome budget bonus. This advance should continue this year, considering the government's ambitions in both electronics and research. The company's 1981 report does mention, among other points, the acceleration of its installation on new sites, an increase in personnel, and the status of its pilot projects.

The INRIA was created in early 1981, because of a desire to break apart and decentralize the former IRIA [Information and Automation Research Institute]. By early 1983, it will have three centers: Rocquencourt in the Paris region, Rennes, now being completed (both of these are already operational), in addition to Sophia Antipolis on the Valbonne plateau near Antibes. This center is now under construction. On 16 June 1981 an administrative decision allocated 17 million francs to this facility.

The total 1981 budget amounted to about 123.6 million francs (compared with 75.5 million francs coming from the IRIA in 1980). 17 new jobs have been created, bringing the staffing level up to 381 jobs. 28 additional jobs are to be created during 1982.

In terms of equipment, at the end of December the CII-HB [International Information Company-Honeywell-Bull] DPS Multics system was expanded to three central units (16 Mo) linked to 282 terminals. The system was first put in in 1980.

To handle communications between projects and services, no matter where they may be located, the Multics system is to be integrated with the DSA design of the CII-HB system, and interconnected with local networks which are gradually to be set up in the centers.

Pilot Projects

The INRIA has responsibility for four types of missions:

a) To undertake basic and applied research;

b) To develop experimental systems, associating as closely as possible both the public and private sectors;

c) To organize international scientific exchanges; and

d) To ensure the transfer and dissemination of knowledge and knowhow on a nationwide scale, by means of training and information.

In the area of research, particularly significant efforts have been made in robotics. There is a real workshop which should become operational in 1982, established with the assistance of the ADI [Data Processing Agency]. Several types of sensors are being tested as part of the ARA [Advanced Automation and Robotics] project.

Another noteworthy effort concerns the CAO [Computer-Aided Design] of highly complex VLSI [Very Large-Scale Integration] circuits. The studies being done in conjunction with Thomson, CIT, ALCATEL, SAGEM [Company for General Applications of Electricity and Mechanics], and CII-HB cover both the design of these circuits and the development of software systems.

The report also discusses the status of four pilot projects, for which the INRIA is either the sole contractor, or is working in association with other organizations.

1. SOL. This project covers the development of a standard base software system for French-manufactured mini and microcomputers.

The complete specifications for the SOL system have been determined. It is to be used on three machines: the Mitra 125, Mini 6, and SM 90. A SOL suppliers-users club has been created.

2. Sirius. The INRIA now considers that this distributed data base project has entered its final phase.

Here the effort will concentrate primarily on industrial spinoffs. Intertechnique will list in its catalogue the "Sirius Delta" SGBDR [Distributed Data Base System] whose prototype was developed in this project. This system, which integrates the different techniques developed, can be used to manage different types of data distributions, while protecting their confidentiality and the integrity of the distributed base in case of a breakdown or access by competitors.

3. Nadir. This project, conducted in cooperation with the DAII [expansion unknown], is studying the possibilities offered by satellite communications systems in general, and the possibilities of Telecom I in particular, with the development of the ANIS simulator.

4. Kayak. In cooperation with the ADI, this project is to develop the Mobile method for designing an office automation plan for businesses.

International Missions

International relations include an agreement with the University of Kyoto to conduct a colloquium in Japan this year.

There have been 329 missions abroad, of a total of 1,520, and 69 internationally-oriented conferences conducted as INRIA seminars.

Nationally-oriented conferences, totaling 243, have covered the establishment of clubs bringing together public and private organizations for developing modular software libraries: Modulef (finished elements), Modulopt (optimization), Modulad (data analysis), and Moduleco (economics).

Nine courses, with both a national and international focus, were given in 1981.

The publications center has recorded earnings for its publications of about 221,000 francs (18 percent sold abroad), an increase of 16 percent over sales in 1980.

The INRIA officials are now waiting to learn details about provisions of the new law on research and information about decisions made affecting electronics, so that their future can be programmed with precision. This information should be available within the next few weeks.

7679
CSO: 3102/302

POSSIBLE STRATEGIES FOR EXECUTING MICROELECTRONICS PLAN

Paris ELECTRONIQUE ACTUALITES in French 23 Apr 82 pp 1, 15

[Article by J. -P. Della Mussia]

[Text] For the last several weeks, certain members of the government responsible for problems of the electronics industry have officially declared that the five centers which manufacture integrated circuits that are considered as French (EFCIS, Thomson-CSF, RTC, Eurotechnique, and MHS) are too numerous, and unofficially stated that a recombination of the Thomson-EFCIS activities with those of Eurotechnique is inevitable. Many of the DIELI (Bureau of Electronics and Data Processing Industry) meetings have already considered this matter, but no decision will be taken before next July, especially since to our knowledge neither Eurotechnique nor National Semiconductor (NS) (49 percent of Eurotechnique) have yet been consulted about it. And while a reduction in the number of centers does appear desirable at first sight, the implementation of this project seems to be difficult; for EFCIS and Eurotechnique in particular, a joint administration could offer more drawbacks than advantages if NS continues to play along with its subsidiary, and especially if it gives it even more autonomy, as could be assumed from some of the statements of Dr Heikes, chief executive of NS in Europe.

But even before thinking about a reduction in the number of centers, it is appropriate to re-examine the reasons that have led to the formation of new centers as part of the first integrated circuits plan.

Why Five Centers?

Let us remember that before this first plan, three semiconductor companies located in France were receiving government support: Thomson-CSF, EFCIS, and RTC. Of the three, RTC is today the only one of world class in the narrow field of ECL. Thomson-CSF's bipolar integrated circuit division has a primarily European market in linear devices. EFCIS' production activity really began only two years ago; in 1981, its circuits turnover (except for studies) did not exceed 100 MF, which is a low figure compared to Intel's 2900 MF, for instance. It is out of the question for EFCIS to enter the market of high volume circuits, such as memories: Toshiba itself, for example, which this year will invest 500 MF in semiconductors (1981 turnover in this area was 4700 MF), has decided not to manufacture 64 Kbit RAM's!

It was to meet this French need for large standard MOS circuits, that the French creators of the first integrated circuit plan formed Eurotechnique.

The alliance with NS enabled this company to acquire a remarkable industrial know-how: last March, it produced one million chips with a yield which NS executives themselves pronounced slightly superior to their own.

The Matra Harris (MHS) operation was the last in the sequence. Its original slot, with a top of the line C-MOS orientation, appealed especially to DAII (International Industrial Affairs Directorate) executives. Added-on was the top of the line bipolar operation, whose goal was equally specific, and which was not supposed to upset the overall integrated circuits plan.

Finally, it became possible for MHS, the company thus created, to manufacture MOS circuits as an Intel second source. The question then arose as to whether three MOS centers were not too many for a country which represents only 4 percent of the world market. At the time, DIELI conducted a detailed study of the advantages and drawbacks of creating this third center: their finding was positive. Although this study has not been made public since then, we may suppose that this decision was essentially motivated by the fact that many users wanted to see Intel family microcomputer circuits manufactured on French soil, and that this formula could constitute a kind of guarantee for MOS mass production, in case the Eurotechnique operation was not successful. But the agreement with Intel is only a second-source agreement similar to the one between EFCIS and Motorola. The only two genuine, major unions have been those of NS and Saint-Gobain to form Eurotechnique, and of Harris and Matra to form MHS (the MHS-Intel union for Cimatel involves only circuit design, and not joint production with Intel).

Do Components or Systems Benefit?

The present situation is therefore the following: for linear devices, government support is going to Thomson-EFCIS, MHS investment in this field having been postponed.

For digital bipolars, support is going mostly to RTC's ECL families, but now also to Thomson-EFCIS.

The fact is that the Thomson group divisions have always required a French source for their 2990 digital bipolar family in particular, and the bipolar division of Thomson-CSF decided over one year ago to expand this activity. However, the basic vocations of RTC and Thomson-CSF appear to be different: RTC wants to perform as well as possible in its slot on a world scale, the bulk of its market being in the United States. Conversely, Thomson-CSF's orientations arise from French requirements.

RTC wants to derive its profits purely from semiconductor activities. For Thomson, it is conceivable that profits can be found in systems, by adapting components to the needs of the group or of other French customer firms. (Thomson-EFCIS however, has broader ambitions).

Great Differences Among MOS Companies

In MOS and C-MOS the three companies involved have three highly different natures.

Thomson-EFCIS started from an almost non-existent industrial level to reach world status; it has to conduct its own research and strengthen its international sales

network. The group benefits from a 100 percent French image, which means that Thomson-CSF, and French universities or industries first turn to it for implementing original system ideas. Thomson-EFCIS, which has a powerful design team, thus also receives a healthy influx of know-how. This influx is the company's only true strength in exportation development thanks to innovative circuits. But it will certainly not be able to be competitive for quite some time in mass producing standard circuits, simply as a matter of scale. We made some (wicked) comparative ten-year calculations assuming a flattering turnover growth (exclusively for production) of 50 percent per year at Thomson-EFCIS and 25 percent for Intel; this would result in a turnover of 5766 MF for the former and of 32,410 MF for the latter, or in a ratio grater than five between the two companies. This ratio would still force Thomson-EFCIS into a slot policy.

MHS on the other hand benefits both from Harris' research and development, and from an already existing commercial network: Harris in the United States (which will probably remain relatively small) and the joint MHS-Harris network in Europe (which is being bolstered).

In C-MOS moreover, MHS can immediately aspire to industrial mass production as a result of its alliance with Harris. Compared to EFCIS, the company thus has three trump cards from which it might derive an exponential growth throughout the firm's launching phase.

The company must nevertheless expand its research and development to eventually acquire a certain autonomy, and most importantly master the most advanced H-MOS technologies. On the negative side, for the time being MHS has a weaker potential for French innovation than EFCIS, but this drawback should be minimized as the strength of Cimatel, in particular, increases. Thus, in the long run, this company promises to attain world class for C-MOS, and specialist class for MOS, in full competition with EFCIS for the latter technology. We do not foresee that MHS, any more than EFCIS, will one day become competitive for mass produced MOS circuits.

The Case of Eurotechnique

Eurotechnique represents a rather exceptional venture. Unlike the other MOS companies, it wants to develop mass market circuits, which means that it must reach world class in order to be profitable. But it had four handicaps from the start: a non-existent sales network; a limited catalog; no circuit sales (unlike EFCIS and MHS) to generate turnover; and almost no research and development of its own (compared to other world class companies). Nevertheless, Eurotechnique has two advantages which have enabled it to adhere to its development plan. On one hand, NS is playing the game to the hilt: in particular, it has sent to Rousset its most up-to-date industrial know-how and all the masks that Eurotechnique wanted; on the other hand, the Eurotechnique team seems remarkably cohesive, efficient, and free to take initiative, since the St-Gobain partner is not an electronics component user with a vested interest in any particular orientiation on the part of the company. And finally, Eurotechnique has an additional circumstance in its favor: the leading United States semiconductor firms do not want to rub shoulders with Japanese companies among their distributors. Distributors for the Japanese thus readily accept Eurotechnique, whose MOS line is the same as that of NS, especially since

this company must be paid in francs, "a weak long-term currency." European distributors also welcome this European company, which spares them the 17 percent customs duties, and which constitutes a valuable local resource in case of lead-time extensions. In this way Eurotechnique achieves 65 percent of its turnover in exportations.

United But Not Necessarily by Love

Three MOS centers are too many in the eyes of the government, which feels obligated to support all three. From the users's standpoint however, the situation is very desirable: they have a French source for Intel circuits, for Motorola circuits, and for MOS memory circuits, as well as different services for custom circuits. But for this, these three centers would have to be long lived. Hence the government's idea of concentrating its efforts on only two companies.

Three plans for concentration are conceivable:

Join Thomson and MHS. This is the most rational solution for forming a "supercompany" with specialist status for MOS and world status for C-MOS; it is not a conceivable one at this point because of the rivalry that exists not only among upstream groups, but also among personnel and families of products.

Join Eurotechnique and MHS. This implies a four-way marriage (Matra, Harris, Intel, NS), which we find difficult to imagine but which would lead to a world class company both in MOS and N-MOS, since their catalogs match reasonably well. Faced with such a potential for innovation and industrial know-how, EFCIS would find it difficult to be anything else than a quasi-captive company for Thomson.

Join Eurotechnique and EFCIS. Their catalogs would be complementary but poorly matched: 8048 circuits for instance, would still be made by two centers in France, unless their fabrication was abandoned, with Eurotechnique becoming the mass production industrial branch for EFCIS products. As Eurotechnique warned : "Should this solution be adopted, the Rousset plant would be empty in one month." NS could not accept such a solution in any case, and if NS were to stop supplying the masks for new memories, which are the moving force for mass production know-how, Eurotechnique could no longer sustain world ambitions. For reasons that we have already given, it is out of the question for France alone to design mass production memories for a number of years to come. And what is more, it would be a pity to bring a dynamic team into the inevitably rather bureaucratic environment of the Thomson group.

The NS Trump Card

It would also be a pity to abandon an operation with NS, because it is the only chance to have on French soil a large N-MOS mass production, with a research and development program that is financially out of the reach of French companies. It is also true that while EFCIS and MHS have a well defined path with the weaknesses already indicated, Eurotechnique still has to develop a certain personality which in coming years will elicit interest in it the world over. This lack of image follows from inadequate research and development compared to world class companies, and from a small design center, even compared to that of EFCIS, or of Cimatel + MHS in the future, for instance.

NS has already said that it is ready to do even more. What could it contribute? Original research and development technology to lend some character to the company, and markets to justify manufacturing volume. This R&D could for instance cover EEPROM technology, which would allow the French company to design original products and in the future to begin volume production of standard EEPROM memories as replacements for EPROM's. Among others, the original products developed could be circuits to replace fusible-programmable TTL's (PAL, IFL, FPLA, and so on), thanks to a C-MOS structure programmable by means of non-volatile memory points.

NS could also bring markets to Eurotechnique, by opening its sales network to one or two product lines (ROM, RAM, microprocessors, or others), and by reducing the corresponding production in the United States (which is in fact what IBM does internally, depending on the manufacturing outputs of its various plants).

Collaborate or Concentrate?

As we can see, the union of companies appears very difficult even without taking into account the hostilities that currently exists among them. In fact, it would have the drawback of reducing overall French products sales abroad. Moreover, three companies are indeed too many if they depend primarily on the French market for their development. But the seven major Japanese semiconductor companies are aiming at the world market, and they succeed. Are there then other alternatives to avoid the scattering of the government's efforts? We can think of three.

Some research for the three companies could first of all be financed in joint public or quasi-public laboratories: semiconductor defects, self-testing, X-ray lithography resins, basic EEPROM technologies, and so on (in fact, this research could be conducted at least at a French-German level, if not at a European one).

In addition, a laboratory to evaluate the most advanced equipment could be established (also, why not, at a French-German level at first). This laboratory would systematically purchase all the advanced equipment being made in the world, and rent its installations for one or two weeks to Siemens, Thomson, Matra, and so on. Each of these companies could then select its equipment with some experience.

As a third possibility, production could be standardized to avoid having two French production lines manufacturing 2K x 8 static RAM's or 8048's, for instance. The upstream Matra or Thomson groups would not see eye to eye on this, but if they realy want to have a production line in their semiconductor division, why should they not pay the price of a captive production?

So far, the three semiconductor companies in question have kept--or almost--their promises as part of the first integrated circuits plan. In our opinion, it is too early to stop trusting one of them and break the pace. The accounting will come in 1986.

11,023
CSO: 3102/277

REPORT ON ELECTRONICS INDUSTRY MAKES RECOMMENDATIONS

Paris LE MONDE in French 14 May 82 p 35

[Unsigned article: "A Whole Which Can Only be Treated as a Whole"]

[Text] Jean-Pierre Chevenement, minister responsible for research and technology, and Mr Mexandeau, minister of mails and telecommunications, presented to the press on Wednesday, the report written by the Electronics Industry Task Force, chaired by Abel Farnoux.

The result of several months of joint work and study by representatives of all the ministries involved, the voluminous report of the Farnoux task force represents the first global study of the French electronics industry as a whole. We simply regret that the demands of national defense have led the Ministry of State, which headed the task force, to present only an expurgated version of the report to the press and the public.

The task force makes several proposals in matters of research budget, training, education, and relations among researchers and industrialists. Its major recommendation is more political. The task force in fact asks the government to assign the highest of priorities to the development of the electronics sector, to perceive its development in a global framework, and to install a coordinating structure responsible for "impelling and coordinating the activities of the sector's many participants."

The creation of this state secretariat for the electronics industry, advocated by the task force, depends on the assessment that the President and the government will make of the appropriateness of such a measure. Or in Chevenement's words: "This is a proposals report. It is now the government's job to draw conclusions."

In 1981, the electronics sector industries had a turnover of 96 billion francs. The nationalized groups provided 50 percent of this production, and the subsidiaries of foreign companies 30 percent (of which 13 percent from IBM, and 7 percent from Phillips). The trade balance of the sector as a whole was negative (1.5 billion francs) in 1981 due to deficits in consumer goods, computer, and office machine activities (-10.5 billion), which the positive results of professional electronics and telecommunications (+9 billion) could not counterbalance.

In order to re-establish the trade balance, create jobs, and place the French electronics industry on a par with the United States and Japan, the task force chaired by Mr Farnoux advocates a total therapy based on a few major orientations.

All areas of the electronics industry are "interdependent" in the eyes of the task force. The sector therefore constitutes "a single unit, and can only be treated globally."

"France must refuse to accept a slot policy. We must implement an overall sector recovery strategy, which first involves the development of our strong points: professional resources, and telecommunications-telematics. It is only by maintaining these two areas at the best world level...that we will be able to recover the situation of the weaker areas." Among these, "it would be appropriate to carry out a recovery effort in four areas: computer processing, office automation, consumer automation, and components."

The task force recommends an action coordinated at three levels: research, industry, and support policy.

Research

The money allocated to research-studies-development should be increased from 12 billion francs in 1980, to 20 billion (constant francs) in 1986. In order to "invest to obtain full value from each franc," the task force recommends the launching of national projects. "In the form of 'public interest groups', 'economic interest groups', or 'industrial development companies', these projects would join public or private research teams with industrialists and users, to launch new products involving technologic advances. The industrialization and marketing would remain the job of the industrial partners."

Fourteen national projects have already been counted, and Mr Chevenement has indicated that work teams will be immediately assigned to each of them.

Industry

Reminding us that the French domestic market is equal to only 6 percent of the world market, the task force estimates that "the French electronics industry cannot reach third place in the world unless it becomes strongly implanted on foreign markets."

The task force recommends the establishment of European cooperations, notably in the consumer area. "The stakes are such that the policy known as 'controlled delay', which consists of importing Japanese or American goods and then producing them under license, and which so far has failed in this domain, can no longer be attempted. France has sufficiently strong commercial and technical forces to negotiate an egalitarian cooperation with the Europeans. Technologically united, Europe can take the lead in new consumer products, whose impact on our civilization and culture will be considerable."

In the "support policies," the task force insists on the need to "launch a vigorous training program." If a considerable effort is not approved, there will be a shortage of 500,000 persons for the 1981-1990 period (75,000 engineers-researchers, 25,000 senior techicians, and more than 400,000 technical personnel, employees, and qualified workers) in case of a successful development of the electronics sector. For Mr Chevenement "new solutions must therefore be implemented, not only in terms of initial training, but of continuing training as well."

11,023
CSO: 3102/282

BRIEFS

HONEYWELL SHARE OF CII-HB DOWN--The government and the American Honeywell group have just reached an agreement that cancels the leonine one concluded in 1977, which had created CII-HB. Henceforth, CII-HB (which does not have to keep the Honeywell name if it prefers not to) will be a French industrial company independent of any veto, responsible only to its shareholders, among which Compagnie des Machines Bull will hold more than 80 percent of the capital, and Honeywell the rest (19.9 percent exactly), but only as simple minority shareholder without veto rights. Honeywell has abandoned all its previous rights, that is, the quasi control of the company, in exchange for 150 million dollars. This "new" CII-HB will reach technical cooperation agreements with Honeywell on present and future product lines to be developed jointly. Other agreements will be reached conventionally for products which will be manufactureed mutually under license. In time, CII-HB will be able to make such agreements with other partners. And finally, at the commercial level, a third agreement stipulates that CII-HB and Honeywell, each in its present geographic sphere, will market as they wish the products of the partner so as to expand their catalog, it being understood that the sales organizations will continue to maintain their relationship. The Council of Ministers held on Wednesday, nominated Jacques Stern, currently president of the SESA Company for Computer Services, as president of CII-HB, with the latter leaving the tutelage of Saint-Gobain to come, like the other nationalized groups, directly under the wing of the Ministry of Industry. [Text] [Paris ELECTRONIQUE ACTUALITES in French 23 Apri 82 pp 1,7] 11,023

CSO: 3102/277

ELECTRICITY PRODUCERS PLAN 10 MW WIND POWER PLANT

Amsterdam ELSEVIERS WEEKBLAD in Dutch 29 May 82 p 15

[Article by Fred Kappetijn]

[Excerpt] Wind Power Plant

The argument that the electricity people make such difficulties over wind power because they 'simply are against it' is slowly beginning to lose some of its force. Here and there, a power plant has itself put up a wind power generator to find out how it actually works. But these activities born out of curiosity have not been the end of it. To gain experience, the Cooperating Electricity Producers will, in the coming years, be building a wind power plant which will have a capacity of 10 megawatts (a modern coal-fired plant has a capacity of 600 megawatts). The wind power plant will consist of 40 turbines of 250 kilowatts, which will be adequate to provide 7,000 average Dutch families with power, assuming, at least, that the public network will pick up all peaks and dips in the supply.

The experimental wind power plant should provide an answer to the question whether wind power plants may be included in the public power network without jeopardizing the continuity of the power production or the cost price of 1 kilowatt-hour.

That is, of course, a most useful exercise, and it, therefore, is no accident either that the government had included the same plan in the National Wind Power Development Program No. 2. In this connection, some confusion and resentment arose when the Cooperating Electricity Producers came up with their plan, primarily because the Cooperating Electricity Producers had not consulted the Ministry of Economic Affairs, which finances the National Wind Power Development Program No. 2 and which has delegated its coordination to the Office of Energy Research Projects of the Dutch Energy Research Center at Petten. G. Piepers, engineer and project leader of the Office of Energy Research Projects, recently said in an interview with the engineering journal PT/AKTUEEL: "Among us, it is still a bit hard to swallow that a number of people who, a couple of years ago, were still certain that it was all nonsense, now, all of a sudden, find it such a fantastic solution. One asks oneself what is behind it. We have difficulty with this matter, certainly with the way in which it has been presented by the Cooperating Electricity Producers."

Financing

At the time, it was not clear whether the Cooperating Electricity Producers wanted a second wind power plant, or whether it was a question of the same plant. In retrospect, it appears to be a question of the same wind turbine plant. The costs of the plant have been estimated at 40 million guilders, but nobody will be surprised if the costs become considerably higher. Piepers said that he would not be too surprised if the plant eventually will turn out to cost twice as much. The contract for the construction will probably be awarded in 1983. Then they will also have to agree on the financing. Here, the strange problem arises that it is possible to quarrel who will be allowed to pay. The Cooperating Electricity Producers have in any case already declared that they will be ready to pay at least half the costs, and they even appear willing to take on the entire costs. It could not be nicer, one might say. Wrong. For if one does not contribute to the costs, one has got nothing to say, and that does not suit the Ministry of Economic Affairs. The pilot project constitutes part of the National Wind Power Research Program No. 2 and, therefore, must also comply with the program of requirements to be set up. Apart from this apparently unavoidable quibbling, the fact that everybody slowly seems to become involved with wind power is a sign that wind power will be given a role in the future energy supply of the Netherlands. But how significant will it be? Is all the excitement justified?

With its National Wind Power Development Program No. 2, which aims at the development of large and small wind power generators, the government aims at a wind power capacity in the year 2,000 of 2,000 megawatts via wind turbine plants and another 450 megawatts derived from 15,000 smaller wind power generators. If this target is reached, all these small and large wind turbines will be able to cover 5 percent of the present power consumption in our country, though not even 2 percent of the energy consumption.

That does not seem shocking, but there are, of course, no reasons either not to do it. It is, finally, a question of a clean and permanent energy source which is not influenced unfavorably by an increasing fuel price which may or may not be politically determined. Furthermore, the construction of wind power generators will mean a welcome industrial activity for the Netherlands which, thanks to a good domestic market, may provide a sizable export position. That is nice for the employment situation and the balance of payments.

To this comes, moreover, that the 2,500 MW wind power capacity which the government aims at is, indeed, not the maximum. Through the application of new technology, such as the mounting of small wings to the ends of the wings (tip vanes), a very considerable increase in the energy production is achieved, while, at the same time, the diameter of the wing remains the same. The 'inventor' of this concept, Theo van Holten, Ph.D., engineer, of the Technical University at Delft, has in mind an increase in capacity by a factor of 2.5, and if practice confirms the theory of the ejector effect, even by a factor of 8 to 10.

Cost Price

Even without this favorable prospect, wind power seems to have a bright future ahead of it. This is not due to its nice nature but to its economic attractiveness. Also here money has again prevailed over the ideal. In the brochure ENERGIE STRAKS [Energy Later] from the Association of Directors of Electricity Enterprises in the Netherlands, the authors expect the cost price of 1 kilowatt-hour of electricity generated from wind power to amount to 12.4 cents. This is somewhat more than coal (11.2 cents per kilowatt-hour) and less than oil and gas (14.8 cents per kilowatt-hour). A real breakthrough is expected as soon as wind power generators of 300 to 500 kilowatts have been developed and have been introduced on the market. These wind power generators will be appropriate for industrial use or for use in small wind power generating plants and have a favorable cost-benefit ratio.

Now that the natural gas prices for greenhouses in the Netherlands, at the request of the EC, have been sharply increased, wind power generators will, undoubtedly, become an attractive alternative as heat generators in this sector. As the name indicates, these wind power generators provide no electricity but heat, which is obtained through the conversion of mechanical energy via the friction of a water brake. The heat generators become profitable at a natural gas price of 36 cents per cubic meter. The price is now 35 cents and will, in the not too distant future, have increased to 40.5 cents per cubic meter.

In short, if we are not mistaken by the signs, wind power will have a bright future ahead of it.

7262
CSO: 3102/321

FRG FINDS SWISS NUCLEAR DISTRICT HEATING CONCEPT APPLICABLE

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 18 Jun 82 p 7

[Text] Frankfurt, 17 Jun--In response to a question in the Bundestag the government clarified its attitude toward the experiences of Switzerland with nuclear district heat from the Goesgen nuclear power plant. In 1977 the possibilities for utilizing the heat in the cooling water from power plants was examined in Switzerland. In 1979 the Oltn heat link was studied, in which the cooling water from the Goesgen nuclear power plant was to be used. The Ministry for Research and Technology supported a similar study for the Speyer-Ludwigshafen-Worms area. In the low-temperature heat link, heat from the cooling water of the Biblis nuclear power plant was included for the purposes of the study.

In these studies, the principle was to use the effluent heat without tapping into the power plant, that is, without energy-heat coupling. Since the cooling water is not very warm, it is necessary to raise the temperature of this so-called "cold district heat" to a level sufficient to heat rooms by using heat pumps. To the government's knowledge, no such system to utilize nuclear district heating has even been built.

The Swiss Goesgen nuclear power plant, on the other hand, has been supplying process steam since 1979, which is obtained by tapping into the power plant process, to a nearby factory manufacturing cardboard boxes. According to the information available, high reliability with an availability of 97.4 percent was achieved in 1980-81. The government is of the opinion that the method used in Switzerland is applicable to conditions in Germany. The precondition is, however, that the utilization of effluent heat through an energy-heat link should be considered during the planning stage for the power plant. If it is necessary to tap into the generating process in an already completed power plant, considerable legal problems arise with respect to approval.

Nuclear district heating is already being used in the FRG. In the spring of 1972, process steam was supplied to a nearby industrial firm from the Lingen nuclear power plant. Since expectations concerning the availability of the nuclear power plant were not fulfilled, deliveries were halted again after a brief period. In contrast, the Nuclear Research Center in Karlsruhe has been reliably supplied with heat for heating purposes from the multipurpose experimental reactor for several years.

9581
CSO: 3102/355

REVIEW OF FRG RESEARCH, DEVELOPMENT IN COAL CONVERSION

Rome RASSEGNA PETROLIFERA in Italian 23 Apr 82 pp 376-378

[Article: "Research on Coal Conversion in the FRG"]

[Text] The FRG, which imports more than 60 percent of its primary energy (almost entirely as oil and natural gas), has continually increased its public financing for research and development in the energy field. But whereas before the 1973 oil crisis the funds went almost exclusively to the nuclear sector, they subsequently began to go for subsidizing research in other energy areas also. From a ratio of 85/1 (DM 850 million as against 10 million) for aid to nuclear/nonnuclear energy in 1972, a ratio of 2/1 (DM 1.26 billion as against 616 million) was reached in 1980.

The greater part of the subsidies for nonnuclear energy is related to coal conversion. In view of the fact that it is desired to find energy sources alternative to oil and natural gas, a vast program of studies has been undertaken in the FRG for gasification and liquefaction of coal, as well as for advanced fuel systems for electric-power plants (and for other installations too) that are coal-fired.

The FRG has long experience in the field of gasification of coal. The research in this field was interrupted after World War II because of the importation of low-cost natural gas; but the sharp increases in the price of these energy sources and the anticipation of possible supply difficulties have led to a reconsideration of the coal-gasification technologies.

The objective is to reduce importations of natural gas through conversion of the abundant German coal reserves, with the use of nonpolluting processes. After 1973, pilot plants for various processes were built.

The new projects, based on the technology of the first-generation gasogenes (Winkler, Koppers-Totzek, Lurgi), are aimed at the following objectives: 1) extension of the range of coal types usable; 2) improvement of the yield from coal conversion; 3) increase in the quantity of coal treated and in production of gas per installation; 4) adherence to the quality standards for the gas produced and to the environmental standards.

Among the projects under way (some 10 of them), we cite the following by way of example. Ruhrkohle AG and Ruhrchemie AG jointly manage the 150-ton-per-day

pilot plant based on a license from Texaco. The plant, at Oberhausen-Holten, and ready as early as 1978, has been in operation for about 2 years. Several continuous tests have been carried out, for periods up to 500 hours. About 27,000 t of various types of coal have been converted into 50 million m^3 of synthetic gas, at a maximum rate of 12,000 m^3 per hour. The plant cost about DM 10 million.

Since 1974, Ruhrgas AG, Ruhrkohle AG and Steag AG, in cooperation with Lurgi Kohle and with Mineraloltechnik GmbH, have improved the traditional Lurgi process with development of the new "Ruhr 100" gasogene, which will be installed at Dorsten. The pilot plant, projected to treat a maximum of 170 t of coal per day, was completed in 1980.

The PNP [expansion unknown] Project--In order to improve exploitation of the coal reserves, a gasification process with low specific consumption of coal is being aimed at (in the "autothermal" gasification processes, the coal is used not only as raw material but also to generate the energy for the process). In this case, the energy is furnished as steam or process heat from a high-temperature gas-cooled nuclear reactor, which makes it possible to save from 30 percent to 40 percent on the coal. That is, the combination of coal and nuclear energy makes it possible to generate a secondary energy for the heat market and for production of chemical power supply.

The total development costs for the PNP project (which will be managed by Rheinische Braunkohlwerke AG and by Ruhrkohle AG) for the period from 1975 to 1984 are estimated at DM 1.3 billion. The FRG Ministry for Research & Technology and the Ministry of Economy of the Nordrhein-Westphalia region are furnishing a good part of the funds.

Winkler High-Temperature Process--The traditional Winkler process has proved that it functions well with highly reactive types of anthracite. With this experiment, Rheinische Braunkohlwere AG is extending the development of fluidized-bed technology. With the results from full-scale laboratory tests, the premises for the Frechen pilot plant A, completed in 1978, were created.

The experimental program at Frechen is concentrated on the points that differ from the usual Winkler process: 1) gasification under pressure up to 10 bars, so as to increase the unit capacity and improve the quality of the gas; 2) gasification at high temperatures (up to 1,100 °C) with addition of lime, limestone or dolomite in order to raise the fusion point of the ashes; 3) increasing the degree of conversion of the coal through recycling of coal not gasified.

We go on to consider the liquefaction of coal, the feasibility of which was demonstrated in Germany as early as the beginning of this century.

Bergius had studied the catalytic process, and Pott and Broche the noncatalytic one. The two methods (especially the former) still constitute the basis for the modern processes throughout the world.

The concepts of the technology of the big old plants (which in 1943 provided Germany with 4 million t of fuels from coal) again became the basis of the

FRG's new catalytic process at the beginning of the 1970's. At Bergbau-Forschung GmbH and Saarbergwerke AG, the experiments to establish the data for building new pilot plants (with the progress achieved elsewhere taken into account, of course) have been resumed.

The improvements aimed at in the catalytic process for liquefaction of coal are: 1) reduction of pressure and consumption of hydrogen; 2) increase in process yield so as to reduce consumption of coal; 3) better solid-liquid separation through distillation.

In 1977 it was decided to build a 200-ton-per-day pilot plant at Bottrop for catalytic hydrogenation of coal. A nearby cokery furnishes gas, water, steam and electricity. They hydrogen is taken from a gas pipeline. Ruhrkohle AG and Veba Oel AG were the principal collaborators in the design. The investments for the pilot plant total DM 200 million. The total expenditures of more than DM 400 million are in large part guaranteed by the Ministry of Economy of the Nordrhein-Westphalia region.

The Saarberg process for liquefaction of coal is also based on catalytic hydrogenation, and is aimed mainly at production of distillate oils. The process has been experimented with in numerous small-scale tests. Saarberg is now building a pilot plant that will treat 6 t of coal per day.

The project, with an overall cost of about DM 30 million, is sponsored by the FRG Ministry for Research & Technology and by the Ministry of Economy of the Saar.

The Germans are also participating in projects abroad, so as to have access to the most important technological refinements. Thus, Ruhrkohle is collaborating on the demonstration plant for the Solvent Refined Coal process (SRC II) of Gulf Oil, Exxon's Donor Solvent (EDS) pilot plant and (since as long ago as 1975) in the design work for the 6,000-ton-per-day coal-liquefaction plant to be built at Morgantown, West Virginia. The FRG's contribution to the costs will be 25 percent; another 25 percent will be provided by the Japanese government together with various industrial companies.

Coal should continue to be important in itself also--that is, apart from conversion of it into gases or liquids. Until about 25 years ago, anthracite furnished about 70 percent of energy in the FRG, while it currently covers less than 20 percent of the primary energy market. Efforts are now being concentrated for coal, used directly as a fuel, to regain a good part of its original market share.

In any case, people are well aware of the fact that this presupposes the development of new technologies that meet the following requirements: 1) high yield from the fuel; 2) low environmental pollution; 3) use of low-quality types of coal with high sulfur and ash content; 4) availability and reliability of systems (both small-scale and large-scale) for applications in industries and in electric-power plants.

The efforts of Ruhrkohle AG are aimed at development of the technology of the atmospheric fluidized bed for small units. The "Konig Ludwig" prototype plant,

with thermal capacity of 6 MW, is a small boiler for neighborhood heating as well as for process steam for industrial applications. For these purposes, a new boiler system with fluidized-bed combustion, capable of burning 24 t of coal per day, is being installed at Recklinghausen (in close collaboration with Thyssen Engineering GmbH and with Standardkessel). The cost of the project, including a 2-year experimentation period, will total about DM 7 million.

A second Ruhrkohle project, at Stadwerke Dusseldork in Flingern, is a fluidized-bed installation with thermal power of 35 MW for generation of electricity. It will burn 144 tons of coal per day and will produced 1,200 t of steam per day. It will cost about DM 17 million.

Saarbergwerke AG has developed an advanced type of electric-power plant and wants to build a 220-MW prototype of it at Voklingen in the Saar. Its essential characteristics are: 1) combined gas-turbine and steam cycle; 2) combination of fluidized-bed technology and of the traditional system of burning coal dust for low-value fuels; 3) integration of fume-scrubbing in the cooling tower and purification of the overall flow of exhaust gases; 4) considerable decrease in emissions of NO and SO_2; 5) increase in overall power-plant yield through incorporation of the gas turbine and with better recovery of the heat dispersion for purposes of neighborhood heating. Expected cost: DM 270 million.

The FRG, the United States and Great Britain are jointly developing the technology of fluidized-bed combustion in the IEA [International Electrical Association] plant at Grimethorpe.

Bergbau-Forschung and Vereinigte Kesselwerke AG recently formed Arbeitsgemeinschaft Wirbelschichtfeuerung for the purpose of developing pressurized-fluidized-bed combustion for the combined-cycle process for production of electricity.

Conversion of German coal into GNS [Synthetic Natural Gas] will be possible starting in 1985. The costs are estimated at DM 0.8 per m^3--more than double the cost of the natural gas currently contracted for 1985. With application of nuclear-process heat after 1990, a reduction in the cost of GNS is expected. In the FRG, the price of natural gas follows the price of oil. Synthetic gas from coal, estimated at DM 0.24 per m^3, should cost only 50 percent more than that from oil.

In the FRG, gasoline from big coal-conversion plants costs about double that from oil. Ten years ago, gasoline from coal cost 250 percent more than gasoline from oil. Something similar is true for all the other liquid products from coal. The German liquefaction program is aimed more toward the light oils than toward the heavy oils for electric-power plants, in view of the fact that there are very few electric-power plants and mineral oils in the FRG.

The price of coal in the FRG is not expected to be unpredictable like the price of OPEC oil. It is therefore considered that the design work for large coal-conversion plants will begin right away with the new national energy programs.

The first decisions could be for several gasification complexes of 1 million t of coal per year per unit and for liquefaction plants of 1.5 million t of coal per year.

Equally important is the program aimed at more rational burning of coal, especially in the electric-power plants, in view of the fact that this will remain the field of major coal consumption.

11267
CSO: 3102/305

BRIEFS

FUEL FROM TIRES, GARBAGE -- Two experimental plants in Great Britain -- The first one, located near Wolverhampton in the Midlands, is intended to produce light fuel, solid fuel and reprocessed steel from used tires. This unit, the cost of which is estimated at 6 million pounds sterling, co-financed by the British government, the European Community Development Fund and private capital, should be operational in 1984. From 50,000 tons of tires, it could produce 17,000 tons of light fuel, 17,000 tons of solid fuel similar to coke, shaped into briquettes, and 7,000 tons of steel, using a pyrolysis procedure developed by the Foster Wheeler Power Plant. Another experimental unit to start production shortly, will produce synthetic petroleum from household garbage. This experimental plant is the outcome of research conducted at the Institute of Science and Technology at the University of Manchester. About 10 tons of scraps are needed to produce 25 barrels of petroleum, the cost price of which would be $15 per barrel. The treatment, the cycle of which takes 10 minutes, consists of placing paper, vegetable scraps and cellulose products in a pressurized tank, together with hydrogen. This treatment thus reproduces at an accelerated rate the natural process of the formation of hydrocarbons. The product obtained has a good calorific value and contains neither sulfur nor nitrogen. [Text] [Paris SEMAINE DE L'ENERGIE in French 20 Apr 82 p 11] 8463

CSO: 3102/295

FRENCH FIRM DEVELOPS HIGH-SPEED ELECTROLYSIS

Paris INDUSTRIES & TECHNIQUES in French 20 May 82 pp 155-156

[Article by Christian Guyard]

[Text] Metal plate deposited 60 times faster with no deterioration in quality with electrolyte moving at 2 kilometers per minute.

People have been electroplating for a long time. In close to a century, now, they have of course made considerable progress in quality, but in all that time the speed of the process has been increased by a scant four or five time. Using an electrolysis current with an anodic phase triples the speed and improves quality, but it also overloads the generators. On the other side of the equation, price rises are forcing electroplaters to deposit plating metals only where they are absolutely required. A purely metallurgical process, known as colaminage, coats tapes with gold or nickel tracks. It is, however, confined to thickness greater than 5 microns. Sometimes the specification calls for the plating to be laid down in perfect concentricity around a bar. For this purpose, there are two very complicated machines which deposit a scant 2.5 microns per minute. In cases where you must quickly recoat very large pieces on the site, ways must be found to shorten down-time and avoid disassembly, which is always costly. The "buffer" method provides a solution, but its performance is very low. Therefore one is constantly running into problems with costs dimensional precision.

The Ceres Company in Romainville has developed a high-speed electrolysis system it calls Certec, which boosts plating speeds by a factor of 20 to 60, depending on the metal. The metallic coating is extremely regular, even on cylindrical surfaces. On tapes, it can lay a thickness of a single micron of gold or 5 microns of nickel. Extremely well suited to the continuous "roll-by" process for rell- or spool-wound products, the process lends itself well to very thick point-plating. It uses simple electrolytes and direct current. The generator thus requires only a modest investment.

Expressions of interest have been forthcoming from the most disparate industries, including microelectronics, ,etal processing, pre-extrusion coating, and anti-corrosion. All of them will find the new process will eneble them to cut fabrication time and costs while maintaining high quality.

Tapes: 10 to 20 mm/min.

Deposit speed is limited, for a given quantity, by the polarization of concentration, or, in other words, the impoverishment of the solution around the cathode. Here, though, the thickness of the boundary layer is reduced by the very high speed (anywhere from 100 mm per minute to 2 km/minute) at which the electrolyte circulates, which sets up a turbulent hydrodynamic system. Introducing inert solid particles, such as glass marbles, further increases the turbulence of the layer.

In order to make the transit from this principle to industrial application, its discoverers had to define the geometry of the electrolytic cell and calculate its dimensions as a function of the form of the substratum and the area to be treated. For one thing, the distance between electrodes could not exceed a few millimeters. The simplest example is that of a round wire and a concentric cell. In roll-by machines, the problem of electrical contact with the line is solved by a second cell, inversely polarized, mounted in series. This "liquid" contact will stand the high tensions required. A fixed mask governs the width of the metal deposited on the tapes. The line moves at a rate of 10 to 20 meters per minuts. Circulation is handled by an oscillating piston pump which puts our several cubic meters per hour under 5 to 10 bars of pressure. Its closed-circuit operation prevents any pollution of the electrolyte and of the environment immediately surrounding the machine. The machine uses the standard plating salts -- sulphates, pyrophosphates.... Use of the process for on-site coatings was been studied in collaboration with the Atomic Energy Commission. In 20 minutes, a mobile unit laid a 30-micron stripe of nickel 5 centimeters wide on a flange 6 meters in diameter. A device for plating 2 square meters per hour is now in the design stages. Still another project involves a multi-use machine for cutting, polishing, and plating. Shifting from one requirement to another will involve only a change of electrolyte and polarization.

6182

CSO: 3102/365

MICROGRAVITY RESEARCH

Paris AFP SCIENCES in French 27 May 82 pp 15-16

[Text] ESA's announced and recently approved microgravity research program (see AFP-SCIENCES nº 293, 21 Jan 82, pp 24-25) got off the ground with successful launches of two probe rockets conducted at Esrange, the Swedish launching facility at Kiruna in that country's far north.

The new program calls for the agency's participation in the microgravity research program begun with probe launches by Germany (Texus) and Sweden, and the ESA has its stipulated share of the payloads launched with those first two shots (Texus 5, on 29 April, and Texus 6, on 8 May 1982). The six scientific experiments picked by the agency, all of them in the realm of materials sciences, were supplied by scientific institutions in Belgium (1), France (2), Germany (2). and the Netherlands (1). One technical experiment was added to the payload: an acoustical blender for producing homogeneous metallic samples under micro-gravity conditions.

The user community will get further access to flights aboard probe rockets under the program in 1983, 1984, and 1985.

Probe rockets currently used in Europe make it possible to achieve conditions of microgravity (1/10,000th of earth's gravity) for periods of time on the order of 6 minutes, and they can be used by research teams in developing experiments which will pave the way for later missions aboard the Spacelab and the European-built retrievable instrument-carrier (EURECA). There is no doubt that the scientific results of these two launches, now undergoing assessment, will confirm the value of probe rockets for research in the field of materials sciences under conditions of weightlessness.

6182

CSO: 3102/365

SCIENCE POLICY

FRENCH PLAN REFORM ON MAJOR RESEARCH ORGANIZATIONS

Paris LES ECHOS in French 18 May 82 p 5

[Article by J.M.: "Reform of the CNRS, the AEC, the INSERM as Early as in the Beginning of Summer"]

[Text] Even before the law on the orientation and programming of research has been enacted, Jean-Pierre Chevenement is already tackling the next stage: the reform of the large research organizations. The consultations are in progress, the implementation decrees could be issued as early as in the beginning of summer. On the menu: the CNRS [National Center for Scientific Research] and the INSERM [National Institute of Health and Medical Research], but also the AEC. As well as the organizations for cooperation with developing countries, which will be examined at a future Council of Ministers meeting.

These reforms will be based on four major principles:

. Decentralized management. Thus, the various departments of the CNRS will see their autonomy strengthened. And within the AEC, four institutes will be established: basic research, technological research and development, nuclear security and protection, and military applications.

. Regionalization. The CNRS will appoint regional correspondents who will work with the regional representatives of the Ministry of Research. The responsibilities of the regional AEC centers will be increased.

. Democratization and opening up. As foreseen, personnel representatives will sit on the boards of directors of research organizations. Personalities from the economic world and from labor will also be present.

. New missions: development, scientific and technical information, and training. Within the CNRS, a directorate for development and a directorate for scientific information will be set up.

This reform will not necessarily entail major changes at the top of the research organizations. The two-headed structure of the CNRS -- a president and a general manager --, which has so often been criticized, may not be abandoned. "Everything depends on the people involved," noted Jean-Pierre Chevenement. The authority of the president and of the general manager will simply be clarified. On the other hand, some redistribution of committees will take place within the CNRS, and specifically interdisciplinary committees will be set up.

For the AEC, one of the elements of the reform lies in the establishment of a board of directors, in addition to the management committee. Will the various measures provided for that organization meet with some hostility on the part of the hierarchy and the personnel as well as with differences within the government? Jean-Pierre Chevenement denied it -- the government knows what it is doing -- and announced the reform of the AEC "as quickly as possible."

8463
CSO: 3102/295

PRELIMINARY WORK TO BEGIN ON MAGNETIC TRAIN FOR BERLIN

West Berlin DER TAGESSPIEGEL in German 19 Jun 82 p 10

> [Text] Probably by the end of 1983, between the Gleisdreieck subway station and the Potsdamer Platz, a completely new local transit system will be in experimental operation with the magnetic train. After much arguing back and forth, the government has given the "green light" for the financing of the magnetic train tests in Berlin with a "declaration of intent" and the "go-ahead for the preparatory planning work," as Senator for Economics and Finance Pieroth stated to the press yesterday. In his communication, the Minister for Research had declared his intention of supporting the operational testing of magnetic train technology in Berlin with a federal subsidy of 75 percent of the total cost, in the amount of about DM 50 million, as long as the parliament in Bonn agreed.

Both Senator Pieroth and a representative of the minister were in agreement, stressing that one could assume that the budget committee of the Bundestag would finally approve the funds. On the basis of the "declaration of intent" from Bonn, the preliminary work for the planned magnetic train operation can begin immediately.

As has been reported on several occasions, in the first stage the closed down subway line from Gleisdreieck will be converted for a distance of 600 meters in the direction of the Potsdamer Platz for testing and technical certification of the new technology at a total cost of DM 19.5 million. Then the practical operating ability of the magnetic train will be demonstrated in a second phase, with an extension into the cultural quarter on the Kemperplatz, for which DM 30.5 million have been set aside.

Pieroth described the decision in Bonn as a joint victory for all parties, which would open the way for a reference facility "which is unique in the world." The magnetic train would contribute substantially to projecting the image of Berlin as a center for research and development.

The magnetic train system is being offered by AEG-Telefunken and developed and built by the Berlin Office for Rail and Road Transport Technology. As Director Milz of AEG-Telefunken explained, almost all the investment for the magnetic train project would take place in Berlin. This would safeguard several hundred jobs.

AEG-Telefunken and Senator Pieroth see the crucial long-term effect in the orders that are expected to follow and the "sale of magnetic trains throughout the world." Large cities in developing countries in particular would have a need for this new local transit system, which was much more cost-effective to manufacture in comparison with traditional technologies. If testing on the reference facility proceeds positively, some thought--so it is said--is being given to the possibility of integrating the magnetic train system into the Berlin subway and intra-urban network, or, alternatively, of converting the modernized intra-urban lines to the magnetic train.

Bonn has been supporting the magnetic train system's development for 7 years. In the meantime, 200,000 kms have been covered on a test facility in Braunschweig on the new magnetic track. The representative from Bonn said that the technology as such was tested and safe. What was needed now was practical operational testing, carrying passengers regularly, which is now planned in Berlin.

Yesterday, the "inventor" of the magnetic train, Goetz Heidelberg, once again explained the design principles and the advantages of the magnetic train compared with the technologies employed until now. The magnetic train has neither an electric motor nor a chassis in the traditional sense, but is carried and propelled by a linear motor on moving magnetic field by means of permanent magnets, which are distributed along the entire line. Wheels and the complicated subframe of the subway or intra-urban railroad cars used until now are dispensed with.

The weight of the magnetic train cars was about one-half less than that of conventional electric self-propelled units for rail traffic. According to figures from AEG-Telefunken and Heidelberg, if the magnetic train is carried on an elevated rail line, construction costs and material expenses are reduced to one-third of those for comparable trains using rails. As a result, energy consumption is also considerably lower. Altogether, investment and operating costs for the fully automated magnetic train would be "lower than those of all other rail-guided local transporation systems."

SPD: First a Sensible Intra-Urban Plan

The spokesman for transportation policy of the SPD fraction in the house of delegates, Staffelt, explained in a statement concerning the magnetic train project that this technology could not be of primary interest for Berlin at the present time. Magnetic train technology was mainly to be considered where new lines were being built. But this was not anticipated in the city in this century. Rather, it was a matter of expanding and/or modernizing existing lines. The Social Democrats would, therefore, not vote for the financial obligations of Berlin needed to carry out the magnetic train tests as long as a sensible, fully financed plan for the intra-urban railroad was lacking. Staffelt concluded his statement by saying: "If we are to have an M-train, then let it be Maerklin."

9581
CSO: 3102/355

FRENCH SEE POSSIBLE DECREASE IN GERMAN AIRBUS PARTICIPATION

Paris AVIATION MAGAZINE INTERNATIONAL in French 15 May 82 p 47

[Article: "Deutsche Airbus Persevering"]

[Text] A voluntarist partner from the very beginning in Airbus Industrie, the FRG is fulfilling a leading role in the development, the production and the financing of the different members of the European family of airliners. In this context, the partnership remains totally intact even though, on the other side of the Rhine, projections as to the future are sometimes characterized by a much greater measure of caution than those of Paris or London. True, the Bonn authorities are being compelled by circumstances to tot up...

At the risk of seeming repetitious, the fact warrants underscoring that Germany has never shown the least hesitancy as to the soundness of the Airbus operation, considered in its broadest and most ambitious sense. And, when it comes to the question of enlarging the present family, Deutsche Airbus officials hasten to point out that all the ideas under consideration have merit, and that a prejudgement in favor of one or the other is not involved in its view, but that prior consideration should be given to consolidating the successes already achieved.

Clearly then, and fully understandably, there is no point in seeking in Bonn or in Munich the key to the decisions that will have to be taken sooner or later as between: Launching of the 150-seater, namely, the A-320, or of the TA-11 long-range liner (which Lufthansa continues to call for), or of the TA-9 or TA-12, both the latter being "stretched" versions of the existing airframe, the first of these providing more carrying capacity and the second longer cruising ranges. On the other hand, as in the case of its military commitments, the FRG, compelled to recognize that its budgetary resources are not the same as they were a few years ago, is adding up its figures.

Furthermore, its structures being different from those of France and Great Britain, and debate more public and assisted, not necessarily helpfully, by a very investigative press that does not hesitate to line up figures that perhaps were not meant to go past the doors of this or that ministry, the accounting is being done entirely by way of public opinion.

What does this mean? That based on the figures already published officially, and in part on those being leaked to receptive columns, a better idea can be had of the magnitude of the German effort to participate in Europe's reconquest of an appreciable share of the world market for airliners. And, as will be seen, the financial orders of magnitude are starting to be impressive.

The German aeronautical industry as such, essentially MBB [Messerschmitt-Boelkow-Blohm] and VFW [United Aeronautical Company], now merged, has benefited from reimbursable governmental aids of 1.35 billion DM for the A-300 and 1 billion DM for the A-310, these amounts having been advanced to help the industry finance its share of the development of the two planes. For the A-300 alone, however, the industry itself has put up 10 percent of the total cost. These initial budgetary loans are, in principle, reimbursable as planes are delivered to the airline companies, but in actual fact the reimbursements are presently being deferred, which is a form of supplementary aid.

On the other hand, to finance the mass production of these planes, the industry has contracted loans totaling 2.85 billion DM, with backing from the authorities. Lastly, the government has provided substantial budgetary aid to facilitate the financing of sales. No figure for this latter aid has been given out officially, but according to the daily DIE WELT, it amounts to 2.04 billion DM. According to this same source, the total of the industry's investments has now gone beyond 2.85 billion DM, having now reached 4.1 billion. This would place the total investment as of now at over 8 billion DM.

Considering that this is a very long-term and burdensome operation, the profitability threshold of which is therefore distant in time, one can well understand the questions being put in Bonn with respect to the possible launching of another Airbus program. Not as regards its credibility, but rather because of the austerity that has befallen the budgets of the different departments and the need to be sure of the soundness of any additional investments.

Germany's participation in a third Airbus Industrie program can thus reasonably be expected to be of the order of not more than 20 percent, instead of the previously anticipated 37.5 percent. If in Bonn's view, aeronautics were to warrant a less conditioned priority, perhaps things would go differently. But this becomes an entirely different question.

Without even taking into account the multiplying effect that economists sometimes wield rather freely, it is nevertheless well to also recall that the Airbus-300 and -310 programs currently represent 18,000 jobs in the German aeronautics industry, 11,000 of which are strictly production-type jobs, in several divisions of MBB, of course, but also among many suppliers and subcontractors, including Dornier.

In sum, in confirming its commitments under the current programs, in participating in the expenses accruing to the A-300-600 version, and in releasing recently further funds to finance sales, the German government has, in its own way confirmed itself as a steadfast and resolute partner. Which does not prevent it from recognizing its own limitations.

9238
CSO: 3102/298

TELEMETRY DATA ON DO 228 CRASH REVIEWED

Gelsenkirchen AEROKURIER in German May 82 pp 516,520

[Article by Ralf Nolting: "What Happened, Now What? — First Findings on Accident"]

[Text] "We find it difficult to understand why they went so far." So summarized chief test pilot Dieter Thomas the unanswered questions of Dornier and the Federal Aviation Office [LBA] following the crash of the Do 228-100 prototype on 26 March of this year in the vicinity of Aichach in Upper Bavaria. Dornier board spokesman Dr. Bernhard Schmidt was more precise in speaking to the AEROKURIER: "We cannot build aircraft for such extreme situations." Both statements were made a few days after the accident. By this time the circumstances of the accident had already been largely clarified since all important flight data had been transmitted to a ground telemetry station before the aircraft broke up at about 400 meters.

Following the first flight on 28 March 1981, the Do 228-100 prototype had been tested in 182 flights for a total of 207 hours. The somewhat larger "Dash 200" reached 180 hours in 145 flights. Thus the total test time of both prototypes had reached 410 hours on the eve of the crash. The first series aircraft was delivered in early March to the Norwegian regional carrier Norving, this just four short months after the Do 228-100 had received type approval from the Federal Aviation Office. The last test flights which came to a temporary end with the 26 March crash were being made to gain the airworthiness certificate of the Civil Aviation Authority (CAA) of Great Britain. A team of eight CAA experts had come to the Dornier plant airfield at Oberpfaffenhofen for this purpose. The members of the "British LBA" initially received a three-day briefing on the previous certification program of the Do 228. The attention of the British was drawn in particular to the so-called "Longitudinal Control System."

On the unlucky day the aircraft with the registration D-IFNS had already made four flights. Dornier chief test pilot Dieter Thomas demonstrated to the British stall behavior in various configurations and single-engine climbs among other things. During the fifth flight on this day Dieter Beckmann, Dornier Do 228 project pilot, was the pilot in command. Also on board were CAA test pilot Alan Grear in the left seat and CAA flight test engineer David Morgan. Alan Grear had been with the British aviation authorities for four years. He had previously flown Tornado, Hawk, Phantom and Jaguar aircraft with the Royal Air Force [RAF] and was licensed

for the Airbus A300 and Boeing 747. Flight test engineer Morgan had, like Grear, served with the RAF before joining the CAA.

This crew took off at 1728 local time under good weather conditions for a second test flight. Takeoff weight was 4,900 kg or 800 kg less than the maximum of 5,700. The CG was 17 percent forward, which corresponded to maximum nose heaviness. Everything that happened to D-IFNS in the subsequent period of almost an hour was radioed to the telemetry station in Oberpfaffenhofen in a total of 134 measuring data.

Six points of the planned test program were accomplished routinely. These included stall tests, trim changes using the flaps, go-arounds and missed approaches. Point 7 of this test series dealt with the "longtitudinal control system" so highly regarded by the British. This also included trimming in pitch. It is configured on this aircraft — as is common worldwide — as a so-called "fail positive system." In precise terms the problem was to simulate what would happen if the aircraft were on autopilot and trim suddenly "ran away" in the direction of nose-heavy. The test program stated this to be roughly "assessment of longitudinal handling using elevator against nose-down stabilizer at 180 kts." It must be noted here that the Do 228 — like many aircraft of this category — is trimmed with the stabilization surface of the horizontal tail assembly.

At an altitude of 6,500 ft and an indicated speed of 180 kts, Alan Grear pressed the trim button on the left side of the control wheel in the direction "nose down." As the recordings subsequently indicated, he held the button down for exactly 3.6 seconds, resulting in a negative angle of 2.6 degrees on the horizontal stabilizer. To counter nose-heaviness, he pulled, with a continually increasing stick force, up to a value of 45 kg. For comparison, Dornier pilots have gone up to 55 kg in tests of this type. Upon reaching 45 kg stick force, the British test pilot set trim back to neutral.

It must be noted here that Grear had, by manually trimming, already simulated an autopilot runaway of 10 seconds. Given an autopilot defect, he would thus have had 10 seconds until the horizontal stabilizer reached a negative angle of 2.6 degrees. But appropriate regulations allow a maximum of 3 seconds of runaway time. In this time the aircraft must be capable of being returned to normal position. Grear thus exceeded the normal tolerances by a factor of 2.5 during this first trim test.

A couple of seconds later he again pressed the trim button forward. And not "progressively," in small steps as customary. Grear trimmed "continuously" in one motion. This time for 7 seconds. The telemetry system registered a 4.6 degree "nose down" position of the horizontal stabilizer. The stick force was measured at 60 kp. And thus the apparently strong-armed test pilot still was able to maintain the flight level. At this moment he asked the flight engineer "Are we in a full nose-down position?" When David Morgan answered in the negative, Grear again applied nose-down trim for three brief periods. After being again questioned, the engineer confirmed "full down." As measured on the ground, this means 5 degrees. But at the moment the telemetry system was already registering 5.5 degrees minus on the horizontal stabilizer. Possibly due to aerodynamic deformation

caused by the now rapidly increasing speed. Now the nose of D-IFNS can no longer be held above the horizon even though Grear is pulling 90 kg on the column.

Only now does he yell to his German colleague Beckmann "Come in the stick!" As Beckmann, who apparently has no idea of the force that Grear is already exerting, begins to pull, the nose is already pointing 30 degrees down. Both are now pulling on their columns with 150 kg. Beckmann commands "trim up" and Grear describes his effort as "trimming." But, as the recordings later show, the horizontal stabilizer at this moment does not move a single millimeter in the direction of neutral. As the nose reaches 34 degrees below the horizon, Beckmann further reduces engine power to 60 percent. At about this moment the airspeed indicator passes the 250-knot mark. At the same time the rudder comes off and shortly afterward the aircraft breaks up. At exactly 302 kts indicated speed, 50 degrees nose-down position and a load factor of minus 3 g. It is 1822.

Three days later on the morning of 29 March and after the first evaluation of the telemetry data, the investigation department of the Federal Aviation Office determines "...based on our present knowledge, we see no necessity to limit Do 228-100 operations." The task of the continuing investigation now is to find out why the trim motor did not start when Dieter Beckmann yelled "trim up!" to his British colleague and the latter confirmed that he was trimming. Was it a trim motor technical defect? Or could the motor simply not start at such high aerodynamic loads? And this leads to the second, obviously important question. That of exactly why the aircraft was maneuvered into such an extreme situation. After all, competent regulations permitted only 3 seconds of runaway time (in the autopilot system). It is thus assumed that the pilot will take action after 3 seconds at the latest. But the British pilot waited seven times as long. He let the trim — transmitted to autopilot operation — alone for a total of 22 seconds. And also why did the Britisher first wait until he had to pull 90 kg before he asked for help? To cite regulations again, they prescribe a maximum stick pull of 22 kg.

No matter what the final accident investigation result may be, Dornier foresees "no great delays" in Do 228-100 flight testing. This is largely due to a rather unique act of assistance in aviation. Norving of Kirkenes, the first Do 228 customer, spontaneously made its first series aircraft available for continuation of the test program. The regional airline noted in this regard "It goes without saying that, by making our Do 228-100 available to the manufacturer, we are contributing to the continuation of the test program interrupted by this tragic loss. We also today have no doubts about the technical reliability of this aircraft."

As early as 5 April Dornier was able to demonstrate the Norving aircraft in Egypt. The potential customers there are Pyramid Airlines and Egypt Air. Following the demonstrations over the pyramids, the aircraft "demoted" from a series version to a prototype received the necessary test equipment at Oberpfaffenhof. The regular test program was continued at the end of May.

The certification program for the 200 series was not effected by the 26 April accident. The required flights for Federal Aviation Office certification are planned for May with those for British certification to follow. Overall only six

aircraft will be delivered this year instead of the planned seven of both versions. Also, the first 100 customers require only Federal Aviation Office certification.

Overall at present there are 27 firm orders, 51 options and 6 so-called "letters of intent" for both versions of the Do 228.

Seven aircraft will be delivered this year, 21 next year and 27 in 1984. An interesting note is that no sales activities have yet been undertaken in North America. But negotiations have been made with a total of 136 potential customers. And this in Africa, a land where Dornier has traditionally been well represented, in Asia, Australia and Europe. At present all negotiations are dealing only with the passenger version of the 228. Dornier now lists the price of the 100 version at DM 3.4 million and that of the 200 at DM 3.8 million.

8373
CSO: 3102/340

A310 FIRST FLIGHT PICTURE-PERFECT REPORTS SAY

Gelsenkirchen AEROKURIER in German May 82 pp 522,523,526

[Article: "Airbus A310: Picture-Perfect First Flight"]

[Text] A great day for the small Airbus. On Sunday, 3 April 1982, in Toulouse the small A310 Airbus made its maiden flight. With Lufthansa colors on the left side and those of Swissair on the right, the A310 lifted off at exactly 0633 GMT only to disappear a few moments later in the still but rather misty morning air. The first flight lasted exactly 3 hours and 15 minutes.

The A310 equipped with the new FFCC [Forward Facing Crew Concept] two-man cockpit was flown by Bernard Ziegler and Pierre Baud. Flight test engineers Guenter Scherer, Gerard Guyot and Jean-Pierre Flamant shared the monitoring of the numerous flight test systems and onboard measuring facilities during the maiden flight. In a first statement after landing, Bernard Ziegler declared "All goals established for the A310 first flight were achieved. It was really a flight without problems and without any surprises since the little bird flies just as pleasantly as its older brother, the A300."

During the maiden flight the A310 was tested over an extensive range from slow flight at 1.1 Vs to cruise at up to Mach 0.75. An altitude of 31,000 ft (9,455m) was reached during the first flight. After the landing, Flight Division President Pierre Baud declared "During the first flight all systems worked perfectly and completely accomplished their mission, that of decreasing crew workload in regard to more economical flight operations." Pierre Baud continued "There is no doubt that this is the result of our previous preparation in the simulator and in flying the similar A300."

The first flight of the A310 was also the start of one of the largest and most ambitious, particularly in terms of deadlines, flight test programs to ever be conducted in Europe. A total of five Airbus A310 aircraft will be put through flight testing in coming months in order to accomplish the tight schedule plan, which calls for A310 type certification including Category II approaches as early as March 1983. The A310 is to begin scheduled service the same month.

Although the first A310 has Lufthansa colors, the airline will never get this special aircraft. Instead of the Lufthansa version with General Electric CF6-80A engines, the A310 just flown has Pratt & Whitney JT9D-7R4 engines as ordered by

Swissair. The second A310 to go into flight test also has Pratt & Whitney engines since it is earmarked for Swissair. The third A310 for flight test will be the first with the General Electric CF6-80A engines and likewise the first Lufthansa aircraft.

Airbus Industrie planning calls for the three aircraft named above to be used for the company flight test program. Two additional A310 aircraft, one Lufthansa and one Swissair version, will be included in the flight test program for route testing and determination of exact performance parameters.

The Airbus program has entered a new phase with the beginning of A310 flight testing. The requirement to develop an aircraft family which is so important to the future of the Airbus program is thus a large step closer to reality. But it must be noted that the A300 is already available in a variety of subversions and thus already seems adequate today to cover the requirements catalog of different airlines. It can indeed be said that the success hitherto of the Airbus is due in large part to the versatility of the available A300 versions.

Despite the great external similarities of the two basic A300 and A310 types, there is no doubt that the A310 is, technologically speaking, a great step forward and, in terms of operational characteristics, is virtually a new aircraft.

Once again the most important technical characteristics of the A310 in brief:
- wings: the A310 has a transsonic wing with a new airfoil which promises clearly reduced resistance particularly during cruise flight and thus fuel savings. As compared with the A300, induced resistance is reduced by a greater aspect ratio. Simplified flap systems and control elements decrease manufacturing and maintenance costs.
- cockpit: much has already been written about the modern cockpit philosophy of the A310. This A310 concept known as FFCC is based on the widest possible replacement of mechanical or electromechanical instruments with modern, computer-controlled video display systems. The A310 also has an integrated flight control and flight management system that not only reduces cockpit crew workload but primarily contributes to the A310 being always able to make economically optimum flights.
- materials: Airbus Industrie sees a valuable contribution to reducing energy consumption primarily in the successful efforts to decrease the gross tare weight of the A310. This was achieved by comprehensive use of modern compound materials, particularly in the so-called secondary structure.
- engines: aerodynamic refinements on the A310 are complemented by corresponding improvements in the engine area. As compared with the Airbus A300 CF6-50C engines which are already considered economical, the General Electric CF6-80A3 engines for the A310 will probably have a fuel consumption 6 percent better. Another advantage of these engines is the further reduced noise and exhaust gas emission.
- flight comfort: passengers will also profit from the introduction of the A310. For one thing, the "small" Airbus will have wide-body comfort on routes hitherto flown only with the Boeing 727, DC-9 or similar aircraft with standard fuselage section. For another, as compared with the A300, there will be a number of valuable minor improvements such as greater stowage for hand luggage.
- two-man cockpit: the FFCC has been reported here often and in detail. As is known, this new cockpit concept caused disagreements between pilots' associations

and airlines. A non-flier looking at the A310 two-man cockpit might be very disappointed. Instead of the usual cockpit full of instruments, scales and controls, that of the A310 appears simple, clear and easily grasped. Many functions previously done by mechanical instruments are now electronically transmitted to the crew on a video scope.

Airbus Industrie, Lufthansa and Swissair cooperated closely in defining the A310. This aircraft thus originated from a joint attempt to cover airline requirements as fully as possible with the technological possibilities of modern aircraft building.

On 2 April 1979 the historical signatures were placed on the Lufthansa order. Dr. Herbert Culmann and Reinhardt Abraham signed for Lufthansa. The contract provides for not less than 25 firm orders of the A310 aircraft and options for another 25. Deliveries are to begin in March 1983 with the contract calling for a total of eight A310 aircraft to be delivered to Lufthansa by February 1984.

The total contract value exceeds DM 1.5 billion. In the 1982 to 1984 period Lufthansa will invest almost DM 20 million in initial equipping with tools and fixtures for the A310. To this must be added an additional DM 70 million for the new maintenance center in Frankfurt which is also being built specially for the introduction of the A310. The investment for A310 flight simulator is said to be DM 20 million.

8373
CSO: 3102/339

BRIEFS

NONASBESTOS AUTOMOBILE BRAKES — The majority of German automobile manufacturers are presently investigating the use of nonasbestos brake linings. Only the Volkswagenwerk AG of Wolfsburg and Audi/NSU Auto Union AG of Ingolstadt are using these semimetallic linings on a series basis in various vehicle types such as Golf, Passat or Audi 80. According to a VW spokesman, however, this applies only to disc brakes while drum brakes are still being equipped with conventional brake linings. The Ford-Werke AG, Adam Opel AG of Russelheim and Daimler-Benz AG of Stuttgart are all making large-scale tests. They all state that they may possibly equip new models with nonasbestos brake linings on a series basis. [Text] [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 11 Jun 82 p 7] 8373

END

JPRS 81392

29 July 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 113

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JPRS 81392

29 July 1982

WEST EUROPE REPORT
SCIENCE AND TECHNOLOGY

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BIOTECHNOLOGY

HOECHST CONCENTRATES RESEARCH ON HUMAN INSULIN, INTERFERON

West Berlin DER TAGESSPIEGEL in German 9 Jun 82 p 13

[Article by Henning Engeln: "Medications from Genetic Engineering: Pharmaceutical Industry Projects Cost-Saving Production"]

[Text] Genetic engineering will soon provide the pharmaceutical industry with the possibility of producing endogenous substances with greater purity and less expensively than before. This view was expressed by a speaker for the drug firm Hoechst at a press conference at the International Convention Center.

A second industrial revolution is to be expected from progress with research into genetic engineering. Thus, the treatment of sicknesses would be made easier, manipulated cultivated plants could be expected to have improved nutritional values and increased yeilds, bacteria which devour waste, products would eliminate environmental pollutants, and raw materials, for example metals from ores, could be obtained in a new way.

The Hoechst firm has concentrated its genetic engineering research in two principal areas: The production of human insulin and interferon by manipulated bacteria. As the spokesman for the firm indicated, the pancreases of three swine are required to supply a diabetic's ten day insulin need. An increasing number of diabetics and the side effects of the swine insulin have made the production of human insulin through genetic engineering imperative. At present, insulin is produced, however, in two separate bacteria cultures and must then be chemically combined from two parts of a molecule. The researchers at Hoechst want to circumvent this disadvantage by attempting to generate the total information for human insulin in a single strain of bacteria.

Human interferon, the second substance, which occupies a central position in genetic engineering research, plays a role in the endogenous defense of virus infections and apparently also in combatting cancer. New clinical studies confirm that this substance inhibits the growth of cancer. But at a price of 100 million marks per gram of interferon an insufficient number of experiments are possible to prove without doubt the properties of this substance. Thus the reason for production through genetic engineering is obvious.

9485
CSO: 3102/343

BRIEFS

MICROBES IN MINING--Preussag, Hannover, has shown with a demonstration unit how microorganisms can be employed to obtain metallic raw materials. Ore beds, which normal mining methods cannot economically excavate, can be mined with these helpers. In the United States alone more than 200,000 tons of copper are obtained annually through microbial leaching. According to the opinion of Preussag, raw material beds can be better exploited with the aid of microorganisms in the FRG also, which accounts for 10 percent of the consumption of the world's mining products. Experiments supported by the Federal Ministry for Research and Technology should help to close the gap on worldwide developments in this area. [Text] [Duesseldorf VDI NACHRICHTEN in German 14 May 82 p 19] 9485

CSO: 3102/343

ELECTRONICS

SURVEY OF MICROPROCESSORS AVAILABLE IN FRANCE

Paris ELECTRONIQUE INDUSTRIELLE in French 1 May 82 pp 25-32

[Article by Pascal Levi]

[Excerpts] In keeping with what can now be called a once-a-year appointment, our magazine presents a review of what is today available (or said to be available) in France, in all categories of microprocessors.

Since our last article (May 1981), much has changed on the French market as a result of distributorships, second source technical agreements, and the "standardization" of some catalogs. This year, for instance, Thomson-CSF and Efcis (Company for the Study and Manufacture of Silicon Integrated Circuits) will be combined into a single entity, Thomson-Efcis, as a company which distributes all the integrated circuit production (generally MOS) of the group; similarly, MHS (Matra Harris Semiconductors) and Harris Semiconductors were grouped under the Harris-MHS name, following the agreement reached by the two companies, which stipulates that MHS alone will be responsible for distributing the lines of the two companies in France only.

For a better understanding of the tables, it will probably be necessary to provide some explanations about the notation used here. For instance, microprocessors have been classified into three broad categories:

microP (microprocessors), or simply CPU;
microT (micro-slices), or processors on a slice, cascadable like the Am°2901 of AMD, for instance;
microC (micro-computers), or CPU with RAM, ROM, I/O, and eventually display control, A/D converter, PLL, and so on, on the same chip.

The observations column lists technical comments indicating the specificity of models, or the date of availability. And finally, it is useful to remember that designations such as XMOS or HMOS are only nomenclatures belonging to various manufacturers (NS and Intel respectively, in this case) which indicate a higher performance N-channel MOS technology resulting from a fabrication process less conventional than NMOS, and proprietary to each. HCMOS is directly issued from this type of technology, and corresponds to a faster CMOS.

Microprocessor production in 1982 (in alphabetical order)

Key: (A) Word size (bits) (B) Category (C) Technology

Référence	(A) Taille des mots (bits)	(B) Catégorie µP	µT	µC	(C) Technologie	Observations
AMCC						
AMCC 1256	4			•	CMOS	Cde d'affichage LCD et micro-programme sur deux PLA (D)

(D) LCD display control and microprogramming on two PLA

COMMODORE SEMICONDUCTOR (Procep)						
MCS650X	8	•			NMOS	
MCS651X	8	•			NMOS	
MCS6508	8			•	NMOS	
MCS65C0X	8	•			CMOS	
MCS65C1X	8	•			CMOS	
Z8602	8	•			NMOS	(E)
Z8603	8	•			NMOS	
Z8681	8	•			NMOS	Z8 sans ROM, ni RAM

(E) Z8 without ROM nor RAM

EUROTECHNIQUE						
402	4			•	NMOS	(G) ROM externe (Famille COP) (F)
404	4			•	NMOS	
410	4			•	NMOS	Fin 1982
411	4			•	NMOS	Fin 1982 (H)
420	4			•	NMOS	
421	4			•	NMOS	
440	4			•	NMOS	
444	4			•	NMOS	Fin 1982
445	4			•	NMOS	Fin 1982
2440	4			•	NMOS	Fin 1982
8035	8			•	NMOS	
8039	8			•	NMOS	
8040	8			•	NMOS	
8049	8			•	NMOS	
8050	8			•	NMOS	
87P50	8			•	NMOS	
80CX48	8			•	CMOS	
ETC800	8	•			CMOS	Fin 1982
16032	16	•			X MOS	Fin 1982

(F) COP family (G) External ROM (H) End 1982

HARRIS-MHS

HM6100	12	•			CMOS	
HM8048	8			•	NMOS	Courant 1982 (I)
HM8035	8			•	NMOS	
HM8086	16	•			NMOS	
HM8088	8	•			NMOS	
HM8051	8			•	NMOS	
HM8031	8			•	NMOS	
HM80C48	8			•	CMOS	
HM80C35	8			•	CMOS	
HM80C86	16	•			CMOS	~ 1er trimestre 1983 (J)

(I) During 1982 (J) Approximately first quarter of 1983

INTERSIL

IM6100	12	•			CMOS	Jeu d'instruction PDP-8 (K)
IM80C48	8			•	CMOS	
IM80C35	8			•	CMOS	
IM80C49	8			•	CMOS	
IM80C41	8			•	CMOS	
IM80C51	8			•	CMOS	ROM 32 K

(K) PDP-8 instruction set

ITT Semiconducteurs

SAA 8000	4			•	CMOS	Famille pour applications spéciales (L)
MAA2001	8			•	CMOS	Processeur à base de 8048 pour TV (M)

(L) Special applications family (M) 8049-based processor for TV

OKI (J-TRONIC)

MSM5850	4	•			CMOS	sans ROM pour évaluation (N)
MSM5840RS	4			•	CMOS	
MSM5842RS	4			•	CMOS	
MSM5845RS	4			•	CMOS	
MSM58421RS	4			•	CMOS	Cde de LCD (O)
MSM58422RS	4			•	CMOS	Cde d'affichage fluorescent
MSM 80C48RS	8			•	CMOS	(P)
MSM 80C49RS	8			•	CMOS	
MSM 80C35RS	8			•	CMOS	80C48 sans ROM (Q)
MSM 80C39RS	8			•	CMOS	80C49 sans rom

(N) Without ROM for evaluation (O) LCD control
(P) Fluorescent display control (Q) sans = without

PHILIPS - FRANCE							
F/.ST 1	16	•			NMOS	segmenté } (R)	usage interne Philips
FAST 2	16	•			NMOS		

(R) Segmented, Phillips internal use

RTC - SIGNETICS						
2650-A	8	•			NMOS	1,25 MHz
2650-A1	8	•			NMOS	2 MHz
8021	8			•	NMOS	
8035	8			•	NMOS	
8048	8			•	NMOS	
8039	8			•	NMOS	
8049	8			•	NMOS	
8041	8			•	NMOS	= UPI
80C35	8			•	CMOS	
80C48	8			•	CMOS	
8405	8			•	NMOS	famille 8400 (S)
8410	8			•	NMOS	
8420	8			•	NMOS	
8440	8			•	NMOS	
8400	8			•	NMOS	version « Piggy back »
8510	8			•	CMOS	famille 8500
8520	8			•	CMOS	
8540	8			•	CMOS	
8500	8			•	CMOS	version « Piggy back »
8X300	8	•			TTL-LS	Contrôle d'E/S rapide (T)
68000	16	•			NMOS	
68008	8	•			NMOS	sous-produit du 68000 (U)
68010	16				NMOS	mémoire virtuelle (V) (W)
68020	16	•			NMOS	Version améliorée du 68000

(S) 8400 family (T) Rapid I/O control (U) 68000 sub-product
(V) Virtual memory (W) Improved version of 68000

SAB8088	8	•			NMOS	
SAB8085	8	•			NMOS	
SAB8086	16	•			NMOS	(X)
SAB8087	16	•			HMOS	processeur arithmétique
SAB8088	8	•			NMOS	
SAB8089	16	•			HMOS	processeur d'E/S (Y)
SAB8021	8			•	NMOS	
SAB8022	8			•	NMOS	
SAB8031	8			•	NMOS	
SAB8035	8			•	NMOS	
SAB8039	8			•	NMOS	
SAB8041	8			•	NMOS	
SAB8048	8			•	NMOS	
SAB8049	8			•	NMOS	
SAB8051	8			•	NMOS	
SAB8741	8			•	NMOS	
SAB8748	8			•	NMOS	
SAB80210	8			•	NMOS	E/S série + C.N/A (Z)
SAB80310	8			•	NMOS	= 80210 en « Piggy-back »
SAB80212	8			•	NMOS	E/S série (AA)
SAB80312	8			•	NMOS	= 80212 en « piggy-back »
SAB80215	8			•	NMOS	Cde de 4 afficheurs LED 7 segments (BB)
SAB80315	8			•	NMOS	= 80215 en « Piggy-back »
SAB80218	8			•	NMOS	
SAB80318	8			•	NMOS	= 80218 en « Piggy back »
SAB2920	25			•	NMOS	processeur analogique (CC)

(X) Arithmetic processor (Y) I/O processor (Z) I/O series + D/A converter
(AA) en = in (BB) Control for 4 7-segment LED displays
(CC) Analog processor

SGS-ATES

M3870	8			•	NMOS	Versions à 4 MHz, existent en 6 MHz (suffixe « A ») (DD)
M3872	8			•	NMOS	
M3875	8			•	NMOS	
M38730	8			•	NMOS	4 MHz, existent en versions « A » (6 MHz) avec E/S série dans tous les cas (EE)
M38731	8			•	NMOS	
M38732	8			•	NMOS	
M38733	8			•	NMOS	
M3870	8			•	NMOS	Versions « A » disponibles (FF)
M2872	8			•	NMOS	
M 2875	8			•	NMOS	
M28730	8			•	NMOS	idem avec E/S série (GG)
M28731	8			•	NMOS	
M28732	8			•	NMOS	
M28733	8			•	NMOS	
M38P72	8			•	NMOS	Circuits de développement avec EPROM - existant en version « A » (HH)
M38P733	8			•	NMOS	
Z8601	8			•	NMOS	(famille Z8)
Z8611	8			•	NMOS	
Z8602	8			•	NMOS	ROM externe
Z8603	8			•	NMOS	EPROM
Z8612	8			•	NMOS	ROM externe (II) circuits de développement
Z8613	8			•	NMOS	EPROM
						(famille Z 80)
Z8400	8	•			NMOS	= Z80
Z8400A	8	•			NMOS	= Z80A
Z8400B	8	•			NMOS	= Z80B
Z8001	16	•			NMOS	(famille Z8000)
Z8002	16	•			NMOS	horloges 4 MHz existent en versions 6MHz (suffixe « A ») (JJ)
Z8003	16	•			NMOS	
Z8004	16	•			NMOS	

(DD) 4 MHz versions, exist in 6 MHz ("A" suffix)
(EE) 4 MHz, exist in "A" versions (6 MHz) with series I/O in all cases
(FF) "A" versions available (GG) Same with series I/O
(HH) Development circuits with EPROM - exist in version "A"
(II) Development circuits
(JJ) 4 MHz clocks exist in 6 MHz versions ("A" suffix)

SYNERTEX (ERN)

SY6500/A/B	8	•			NMOS	(famille 6500)
SY6502	8	•			NMOS	
SY6503	8	•			NMOS	
SY6504	8	•			NMOS	
SY6505	8	•			NMOS	
SY6506	8	•			NMOS	
SY6507	8	•			NMOS	
SY6512	8	•			NMOS	6502 horloge externe (KK)
SY6513	8	•			NMOS	6503 horloge externe
SY6514	8	•			NMOS	6504 horloge externe
SY6515	8	•			NMOS	6505 horloge externe
Z8-01MCC	8			•	NMOS	(LL)
Z8-02MPD	8			•	NMOS	Circuit de développement
Z8-03MPE	8			•	NMOS	Version « Piggy-back » pour émulation (MM)

(KK) External clock (LL) Development circuit
(MM) Piggyback version for emulation

THOMSON-EFCIS

SFC8-28018	4		•		Schottky	
EF6800	8	•			NMOS	existe en 1, 1,5 et 2 MHz (NN)
EF6801	8			•	NMOS	
EF6801C1	8			•	NMOS	pour évaluation (OO)
EF6802	8	•			NMOS	
EF6803	8			•	NMOS	= 6801 sans ROM
EF6805P2	8			•	NMOS	
EF6805P2C1	8			•	NMOS	pour évaluation
EF6805R2	8			•	NMOS	
EF6805U2	8			•	NMOS	
EF68705P3	8			•	NMOS	
EF6808	8	•			NMOS	= 6802 sans RAM
EF6809	8	•			NMOS	
EF6809E	8	•			NMOS	horloge externe (PP)
EF68000	16	•			NMOS	

(NN) Exists in 1, 1.5, and 2 MHz (OO) For evaluation (PP) External clock

11,023
CSO: 3102/320

ELECTRONICS

ERRATUM: This article is republished from JPRS 81145, 28 June 1982, No 108, of this series, pp 1-3 to correct certain translation terms.

MICROELECTRONICS PLAN: WIN MARKET, TECHNOLOGY INDEPENDENCE

Paris L'USINE NOUVELLE in French 18 Mar 82 p 55

[Article by Daniel Lacotte: "The Two Gambles of the Second Components Plan"]

[Text] The administration has just announced important measures to promote the French integrated circuits industry. Without changing the structure of the Components Plan launched in 1978, the government has announced the basic outlines of the action which it intends to take between now and 1986: on the one hand, winning back the French market; on the other, attaining true independence with respect to integrated circuit design.

On the first point, the government has not yet reached a decision as to the aid to be granted to manufacturers in order for their production to cover the French market in 1986. On the second point, the minister of industry estimates that Fr 3.4 billion will have to be invested in research and development over a 5-year period. A budget of Fr 480 million is planned for 1982 as of this writing. In any event, the administration has set the rules of the game: one-third of the investments is to be made by the manufacturers.

Two Centers for Classic Circuits, Three for MOS

The French components industry will thus retain the industrial structure established by the 1978-1982 Five-Year Plan, namely: two centers for classic circuits--Radiotechnique-Compelec (a Phillips affiliate) for bipolar circuits and Thomson for linear circuits, but principally three centers for MOS [metal-oxide semiconductor] circuits, which represent 50 percent of the world market.

With respect to MOS circuits (strategic components for the future), the authorities decided in 1978 to build French production on American technology. Thus, Matra is associated with Harris, and Saint-Gobain with National Semiconductor (in a common affiliate, Eurotechnique). Finally, the third MOS center is EFCIS, whose stockholders are Thomson and the AEC. Each firm has a plant (Nantes for Matra-Harris; Rousset, near Marseille, for Eurotechnique; and Grenoble for EFCIS) that started production at the beginning of last year.

The DIELI [Directorate of the Electronics Industries and Data Processing], entrusted with the electronics and computer industries in the Ministry of

Industry, confirms that "the alliances with our American partners will be maintained," and it estimates that present production capacities and plans for developing the three plants between now and 1986 will represent Fr 2.3 billion in turnover in 5 years. At this time, the French integrated circuits market is estimated at Fr 4.5 billion. The conclusion of the Ministry of Industry: In order to win over this French market, the three other plants must produce more in order to make up the difference--i.e., Fr 2.2 billion. Now it is known that in electronics, "in order to get one franc of turnover, one franc has to be invested."

Consequently, in order for French production in 1986 to be able to cover the domestic market, the manufacturers are going to have to invest an additional Fr 2.2 billion--a large sum for which the administration and the manufacturers, which have just passed into the public sector, will both assume responsibility. For the immediate future, nothing has yet been determined as to the distribution of aid to the three groups.

Stemming the American and Japanese Monopoly

There is still the problem of research. In the 1978-1982 plan, public credits were increased to Fr 600 million. This was not enough to attain adequate production volume and at the same time launch constructive research in future technologies. The government is contributing part of the answer, since it will encourage manufacturers to invest one-third of the Fr 3.4 billion necessary for France to have true technological independence in 1986. And the state would thus be ready to pay the remaining two-thirds. "It's a big bill, but independence comes at such a price," they say at DIELI where it is ardently hoped Matra-Harris, Thomson (EFCIS) and Eurotechnique (Saint-Gobain) will "play ball."

Up to now, over the 1978-1982 period Matra-Harris has invested Fr 200 million, Eurotechnique Fr 420 million, and EFCIS Fr 670 million (including Fr 223 million of public aid), for a total of Fr 1.3 billion. The three groups will have to work in double quicktime in the coming 5 years. And this is precisely the gamble of this second Components Plan: Will each of the three partners have the necessary industrial determination to stem the American and Japanese monopoly in the sector?

An Intermediate Solution for Eurotechnique

The launching of this second plan brings up again the problem of Eurotechnique. Will it try to merge the Saint-Gobain affiliate and EFCIS? At the Ministry of Research and Technology, this eventuality is considered a "folly." It is felt that the three centers originally established should instead be retained. But there are two ways of retraining them. For Eurotechnique, it is a question of knowing whether it will remain within Saint-Gobain's domain or if it will be detached from it. The adminstration is moving toward a median solution: Eurotechnique would continue to belong to the Saint-Gobain group but would no longer be controlled by it. The group's reaction: "It is out of the question; we want to control all the operations or none at all!"

At the start of this new Components Plan, it is no exaggeration to state that the 1978-1982 plan made it possible for the three French plants to prove mass production was possible, even if the 1981 results remain modest (production capacity was Fr 1.1-1.5 billion, while real production did not exceed Fr 500 million). Success will be conditioned by rigorous planning of public aid and the objectives to be fulfilled for each of the centers. It will also depend on the groups, and on the willingness of the men heading them to take up the bet.

9380
CSO: 3102/217

BRIEFS

SPECIAL MICROELECTRONICS PROGRAM--The 3-year special program for the application of microelectronics initiated by Federal Minister of Research Andreas von Buelow in January and endowed with $300 million in grants has been received with great enthusiasm. As Buelow announced in Bonn, 1,000 projects to be subsidized have been applied for in the meantime. The purpose of this program is the broad promotion of the development of new products involving the use of microelectronics in order to create internationally competitive jobs. According to the announcement, the 1,000th application comes from a company located in Lower Saxony that wishes to develop an electronic system for time detection, person identification and bookkeeping. It is to be utilized in the private and industrial sectors. As Buelow stated further, more than half of all applications filed so far are product innovations in the fields of measurement and control, particularly in mechanical engineering, but also in the areas of energy efficiency and environmental protection. Ten percent of the projects pertain to applications of microelectronics in the car industry and consumer goods. The program showed a very good response by small and medium-sized companies: more than two-thirds of all applicants employ fewer than 200 employees. The participation of large corporations was below 10 percent. [Text] [Essen ELEKTRO-ANZEIGER in German No 7, 1982 pp 5-6] 9544

CSO: 3102/318

STEAM GASIFICATION OF COAL USING NUCLEAR PROCESS HEAT

Munich ATOMKERNENERGIE-KERNTECHNIK in German No 4, 1982 pages 225-245

[Excerpts]

Abstract [1]

Coal gasification by steam using process heat from high-temperature nuclear reactors

This paper outlines the coal gasification process using a high-temperature nuclear reactor as a source of the process heat needed. Compared to conventional gasification processes coal is saved by 30-40%, coal-specific emissions are reduced and better economics of gas production are achieved. The introductory chapter deals with motives, aims and tasks of the development, followed by an explanation of the status of investigations, whereby especially the results of a semi-technical pilot plant operated by Bergbau-Forschung are given. Furthermore, construction details of a full-scale commercial gasifier are discussed, including the development of suitable alloys for the heat exchanger. Moreover problems of safety, licensing and economics of future plants have been investigated.

Motives, Objectives and Problems of Development

Objects and Boundary Conditions

Methods for producing gas from coal have been known and applied from the beginning of the industrial era. In the coking process coal is heated for example with exclusion of air, in which only part of the coal is converted into gas and the main product obtained is coke. In the gasification of coal, the latter is allowed to react with a gaseous partner and at temperatures above 700 degrees C with suitable reaction management a total conversion is achieved, so that only the mineral components remain as ashes. One of the most important gasification means is steam, which is converted in a heat consuming reaction with the carbon of the coal, while

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[1] The work was carried out by virtue of the collaboration contract between: Bergbau-Forschung GmbH [Mining Research], GHT Gesselschaft fur Hochtemperaturreaktor-Technik mbH [Association for High Temperature Reactor Technology], Hochtemperatur-Reaktorbau GmbH [High Temperature Reactor Building], Kernforschungsanlage Julich GmbH [Julich Nuclear Research Plant] and Rheinische Braunkohlenwerke AG [Rhine braunkohl Works] on the development of the procedure for the conversion of solid fossil raw materials using nuclear process heat with the support of the Federal Ministry of Research and Technology and the District of North Rhine-Westphalia.

a gas arises which is rich in hydrogen and carbon monoxide and can be used and converted in many ways. The process is known as autothermal when by adding oxygen the required amount of heat for the endothermal reaction is generated internally in the gasifier. If the required heat is produced externally and supplied by hunt exchange to the gasifier, we refer to an allothermal method. Further details on the principle and the technical application of the coal gasification may be found in the relevant literature (compare for example B.H. Juntgen, K.H. van Heek: Coal Gasification Principles and Technical Applications, Thiemig Pocket Books, Volume 84, 1981). To evaluate the object of the project of steam gasification using nuclear process heat we must start from the fact that in all the previously used gasification processes the coal had a double function. It is used on one hand as raw material for the desired product, the gas or the secondary products to be produced by synthesis, and simultaneously as a source of energy for the gasification plant. In the practical procedure followed so far this led to the need of consuming 40 to 50 percent of the coal used, to generate the heat needed to implement the reaction, to generate and overheat the steam as well as to cover the other energy needs, for example in the form of electricity, so that only 50 to 60 percent of the coal is converted into gas. The objective of the project is to cover the total energy needs of the gasification plant with nuclear process heat which is obtained from a high temperature nuclear reactor. Through the procedure represented in a very simplified form in Figure 1 it is possible to obtain that 40 percent or possibly even a greater percentage of coal is saved as compared with the conventional gasification methods, the coal specific emissions, referred to the amount of gas produced are reduced considerably and finally as shown by thorough calculations, the economy is effectively improved.

The following boundary conditions of such a development may be indicated:

- The high temperature reactor provides its heat in the form of hot helium at a temperature of 950 degrees C.
- The heat coupling in a gas generator takes place from outside, allothermal gas generator.
- The system pressure is 40 bars.

Concept Features and Crucial Points of the Development

Figure 2 shows the selected gasification process which differs from the conventional method mainly by the type of gas generator.

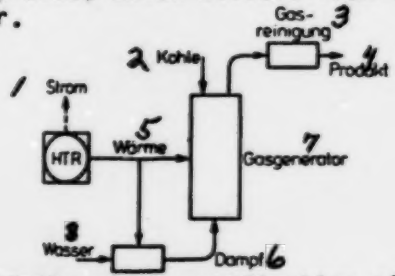

Figure 1: Schematic representation of the steam gasification of coal using heat from high temperature nuclear reactors.

Key:
1. current
2. coal
3. gas purification
4. product
5. heat
6. steam
7. gas generator
8. water

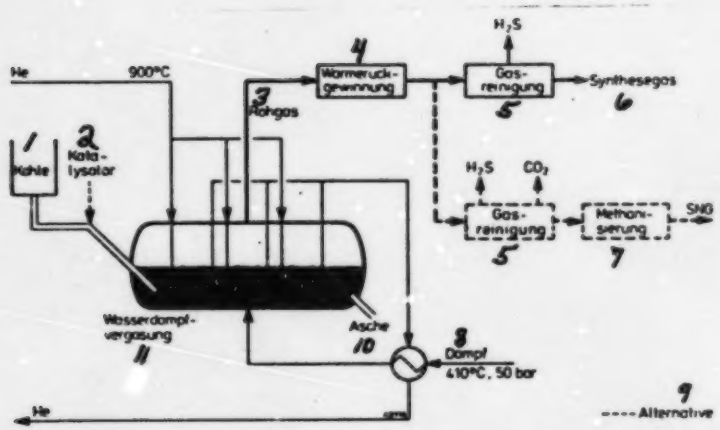

Figure 2: Concept of a gas generator with grooved fluidized bed and gasification plant.

Key:

1. coal
2. catalyst
3. crude gas
4. heat recovery
5. gas purification
6. synthetic gas
7. methanization
8. steam
9. alternative
10. ashes
11. steam gasification

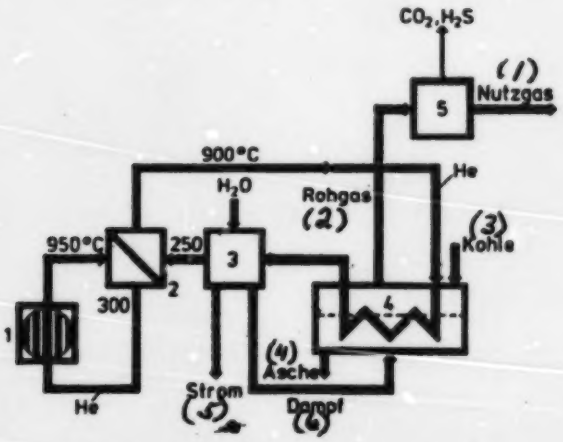

Figure 3: Association of high temperature nuclear reactor and steam gasification.

Key:

1. useful gas
2. crude gas
3. coal
4. ash
5. current
6. steam

Its most important characteristics may be characterized and discussed as follows:

The gasification means chosen was steam. The main reaction of gasification of coal with steam is the heterogeneous water gas reaction in which carbon is converted with the steam into CO and H2. This reaction consumes heat, the nuclear reactor heat can therefore be combined directly in the chemical process. Another advantage of this

gasification means is its "aggressivity". The speed of the water gas reaction does not decrease even with very high burn-up, so that basically it is possible to achieve total conversion of coal into gas. Finally the main products, hydrogen and carbon monoxide can be used in many ways so that the steam gasification of coal represents a basic process for the generation of energy carriers chemical raw materials and reduction gases.

An important feature of the gasification reactor type is the accomplishment of the reaction in a fluidized bed. On the basis of the favorable heat transfer wall to a fluidized bed it is possible to achieve only in this way sufficiently high heat transfer factors from the hot helium to the coal steam mixture to be gasified. They are of the order of about 500 W/m^2 and thus allow for the first time the execution of gasification on technically satisfactory scales. The passage through solid layers lead only to a heat transfer coefficient which is smaller than a factor of about 10. Concepts based on this principle which had been pursued a long time ago as substitute solutions, have meanwhile been abandoned.

For the heat transfer a tubular heat exchanger for which the name of "Immersion" dipping in the coal steam fluidized bed was chosen. It guarantees a high surface density of the heat exchanging areas in the fluidized bed. Suitable high temperature material are basically known and available for its construction but the latter must be optimized.

The organization of the fluidized bed is in the form of an elongated groove. With such a shape it is possible to achieve a high conversion for high periods of stay needed for hard coal. This effect is based on the fact that in the fluidized bed groove remixing can be suppressed to a great extent.

The requirement for the batching of caking hard coal is derived from the fact that the open burning coal available in future for gasification in Germany has strong caking properties. The jet feed used to this end is known from the carbonization process under normal pressure; but this principle must be modified for the conditions of gasification under pressure.

Finally it was arranged to use catalysts in the gasification process. It is thus possible to increase considerably the conversion rate. Because of the chosen concept of a groove it is possible to achieve this with small additions of catalysts, since the active substance is enriched with the burn-up of the carbon in the passage through the groove.

To sum up it may be said that large fluidized bed reactors, for example for coal gasification in the Winkler method can be implemented and applied on a large scale, but the concepts described here needed for the application of nuclear process heat requires in many points a really new development. Figure 3 shows the type of gas generator and the means of its coupling with the nuclear reactor. From the nuclear reactor the heat is discharged first through the primary helium group, which transfers its heat content through an intermediate exchanger through a secondary helium loop. The helium of this loop passes through the above-mentioned immersion heater heat exchanger. There the heat is used for the implementation of the endothermal gasification reaction and, at lower temperature levels, in a steam power plant for generating steam. The latter is used at present as a gasification means and to generate electricity.

The manifold development problems were studied jointly in the project Nuclear Process Heat (PNP) by the partners indicated in footnote 1. In this connection the nuclear reactor companies have the task of assuring by design and experiments the development of the nuclear reactor with the cooling gas intermediate loop including the heat neutralizing components and the steam power plant. The Rhine Brown Coal Works is assigned to the hydrating gasification and the mining research company is developing the steam gasification of coal with the above-mentioned crucial elements.

Steps for the Project Goal

The degree of novelty and the manifold nature of the problems to be solved make it possible to achieve only in stages the objective of the project, specifically the operation of test devices in laboratory and on the semi-technical scale for the experimental determination of the basic design data, the construction of a pilot plant and the demonstration of the procedure in a prototype plant before the industrial application in commercial plants. Figure 4 shows the stages for achieving the goals of the project through the implementation of gasification experiments in laboratory and on a semi-technical scale through the establishment of models and computer programs as well as by design work and development of materials.

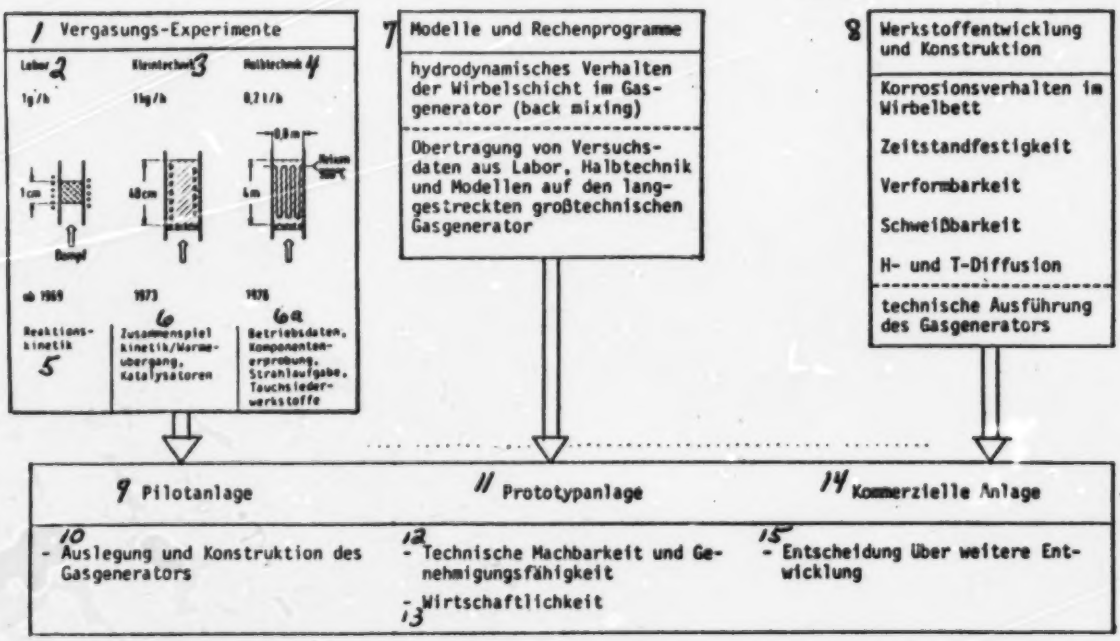

Figure 4: Steps for achieving the project goals. Key: 1. gasification experiments; 2. laboratory; 3. small scale technique; 4. semi-technical scale; 5. reaction kinetics; 6. interaction between kinetics and heat transfer, catalysts; 6a. operating data, component testing, jet feed, immersion heater materials; 7. models and computer programs, hydrodynamic behavior of the fluidized bed in the gas generator (back mixing), transfer of experimental data from laboratory, semi-technical scale and models to the long range large scale gas generator; 8. material development and construction corrosion behavior in fluidized bed resistant in time, deformability, weldability, H and T diffusion, technical structure of the gas generator; 9. pilot plant; 10. layout and construction of the gas generator; 11. prototype plant; 12. technical feasibility and possibility of approval; 13. economy; 14. commercial units; 15. decision for further development.

All these results now give rise to planning work, studies and estimates of the subsequent stage. The next stage planned is a pilot plant which could start operating in 1986. It would have a throughput of several tons of coal per hour. The reactor heat simulated here by heating with electricity or gas. Toward the end of the eighties it would be possible to decide on building the prototype plant, in which for the first time a nuclear reactor would be operated together with the gasification plant. The individual elements of planning and studies as far as concerns the mining research company the layout and construction of the gas generator, the feasibility studies, the fitness for approval and economy of the total plants. The results obtained are important principles for deciding on the further development.

State of Studies

Semi-Technical Experimental Plant of the Mining Research Company.

The basic idea in the organization of the semi-technical plant was to operate in it a gasification reactor which represents a section of the large generator. For the heat exchanger it means that it has the same geometry as a section of the industrial gas generator. Figure 5 shows the immersion heater heat exchanger used in the semi-technical plant. It consists of Incoloy 800 tubes with the provided dimensions of 38 mm by 6 mm. The basic area is 800 mm by 900 mm and the height of the immersion heater dipping in the fluidized bed is 4 m. With regard to the latter it has already been stated that even the fluidized bed height to be used in the semi-technical scale of up to 4 m is oriented according to the corresponding height in the large scale technical gas generator.

But the very important consequence of this fact which must be constantly kept in mind is that for the planned gasification capacity of about 200 kg coal per hour the equipment can be designed only as a standing container and not as a groove. This means that the gasification in the standing fluidized bed reactor cannot be carried out with total back mixing which means in its turn that the high degrees of gasification can only be achieved with disproportionately high times of stay which could not be compared with the large scale variant of the fluidized bed groove.

Further features of the plant are supply of heat through an electrically heated medium loop, the operation of all gas loops and gas generator at a pressure of 40 bars as well as the jet feed for carbon batching.

Further Procedure

Continuation of the Works

The implementation of the project goal, the demonstration of the steam gasification of coal using nuclear process heat must be continued in three crucial points. The purpose of the experimental studies on the laboratory scale as well as the manifold structural process technology and other theoretical studies is to establish further basic data, on which it is possible to set up the next development stages. The gasification developments on the laboratory scale and in the small scale gasification plant should be devoted predominantly to the application of catalysts. For their optimum application it is necessary to have thorough knowledge, for example on the interaction of the catalysts with the mineral substance, and thus determine measures

against inactivation of the catalysts and once again conditions for the optimum application. The plants for the study of corrosion and behavior in time of materials in process gas atmosphere and to measure the permeation of hydrogen and titium through the immersion heater material will be operated further. For a future approval process one must assure the environmental safety of the plant through load data; the latter are obtained mainly by controlled experiments on the existing test plants.

The gas generator itself represents a totally new design for which solutions must be established in detail. The latter was accomplished in the past in collaboration with the Mannesmann Company, jointly with the PNP project partners moreover the concept studies on safety, approval fitness and environmental safety of process heat plants for coal gasification must be continued.

In the semi-technical plant the purpose is to obtain more thorough results and further developments in the next few years. The experimental program provides for the moment for permanent tests on the application of caking open burning coals by means of jet feed. This will be followed by performance experiments. After this period of tests the optimized experimental data will be available for the design of the gas generator for the gasification of caking open burning coal. On the basis of the experiments on the laboratory scale then longer experiments will follow for the application of catalysts. In this connection it will be possible to study under conditions close to the operating ones in the semi-technical plant the use of catalysts, the increase of performance obtained, but also the possible adverse effects on the plant, for instance from corrosion. Finally it is provided to test the recovery of tube gas to save steam.

The purpose of the pilot plant is to carry out experiments on a larger scale, while the testing of the long range gas generator and the determination of the spectrum of the period of retention of the solid substance to optimize the throughput and degree of gasification represent the core of the investigations. This plant will further be used for functional tests of components, permanent tests for collecting operating experience and finally testing how far the results obtained on the smallest scale can be transferred to large plants.

8.2 Prospects of Development

In conclusion we may once again give the reasons why according to the opinion of the PNP partners and many of the parties interested in energy policy and the concerned public consider it worthwhile to develop the steam gasification of coal using heat from high temperature nuclear reactors and consider the further steps as promising:

1. For the pilot plant because of the now more than 10 years development studies all the necessary planning documents are available. Moreover the technical and economical feasibility of the prototype plans have been insured by the work of the Mining Research Company and the project partners.

2. As compared with other gasification processes the following advantages may be indicated:

   -- almost total conversion of coal (95 percent),
   -- 80 to 90 percent more gas per ton of gasified coal,

--lower gas costs,
--less coal specific emissions, especially the possibility of reducing for the first time the emissions of carbon dioxide.

3. The application potential and possibilities of saving coal are very high, as may be discussed in the following examples:

   If in the heating market for example 41 million tons of heating oil (EL) are replaced by SNG this could be achieved in 15 to 20 WKV plants with a gasification of 60 million tons (SKE hard coal units). Moreover electricity is generated corresponding to a coal equivalent of 18 million tons of hard coal units.

   If 37 million tons of fuel are produced for traffic gasification of coal in WKV plants with subsequent Fischer-Tropsch synthesis, 17 to 22 WKV plants are required to this end with a use of coal of 69 million ton hard coal units. The saving of coal as compared with hydration is in this case 43 million ton hard coal units; moreover electricity is produced corresponding to an amount of coal of 21 million tons hard coal units.

   The level reached by the present research and development as well as the important advantages for the economy justify the subsequent continuation of the research and development works.

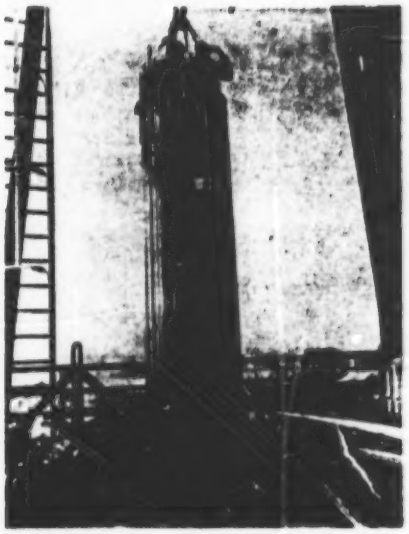

Figure 5: Immersion heater heat exchanger in the semi-technical plant of coal gasification.

9018
CSO: 3102/353

COMMENTS ON BELGIAN UNDERGROUND COAL GASIFICATION PROJECT

Paris L'USINE NOUVELLE in French supplement to 13 May 82 issue pp 10-11

[Article by Claude Christophe: "Underground Coal Gasification: the Belgians Improve the Method:]

> [Text] The gasification of very deep lying deposits, the production of a better performing gas which, in addition, could be transformed into a raw material for the chemical industry. Three "pluses" for the Belgian method.

Thulin in Belgium (province of Hainaut) is a small village located not far from the Belgo-French border. In the cold of a morning last February, a few personalities were brought together to witness a world premiere: the firing of a very deep lying (850 meters) coal deposit. An experiment which, thanks to an original process developed jointly by Belgo-German technicians and researchers, will make it possible to extract a gas of medium calorific power which may be transformed later on into either methanol or methane.

To gasify coal is certainly not a new idea. Mendeleyev and Siemens were already thinking about it in the 19th century. Shortly before the Second World War, the first experiments were attempted, primarily in the USSR (Angren and Yuzhno-Abinskaya). But it is not the very deep lying deposits (beyond 500 meters) that people are primarily interested in. Furthermore, the low yield of the tests have turned researchers more toward the gasification of extracted coal* (yield of gasification: underground 60 percent, extracted coal 97 to 83 percent). Up to now, the best example is undoubtedly the SASSOL [South African Oil Supply Company] plant, in South Africa, which on the average produces 2 million tons of hydrocarbons per year from 13 million tons of extracted coal.

"But," explains Pierre Ledent, director of the Belgo-German in situ gasification experiment, "the production of a fluid fuel cannot be based on extracted coal precisely because of its limited availability and its prohibitive cost price. As for imported coal, aside from rather high prices, it entrails the risk of becoming dependent on the producers of synthetic fuel from Australia, Siberia, Wyoming or elsewhere, after having been ruled by the oil producers from Africa or the Near East."

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*See L'USINE NOUVELLE, weekly edition No 23 of 4 Jun 1981, page 75.

The new Belgo-German process makes it possible to gasify very deep lying coal deposits (1,000 to 2,000 meters). Even though no systematic prospecting has been undertaken as yet, these deposits are estimated at approximately 80,000 tons (minable reserves) for the EEC. However, if this underground gasification process could be applied to seams located at 2,000 to 5,000 meters, this figure could be multiplied by 10.

But its originality, when compared to the other methods (multiple-faces and chambers and pillars), in addition to the fact that it makes it possible to go below 1,000 meters, lies, on the one hand, in the fact that it puts the underground gas source under high pressure so as to increase the rate of progress of the gasification face and at the same time to improve the power produced, the yield and the calorific power of the gas, and, on the other hand, in the choice of the gasifying agents--oxygen and carbon dioxide--which would make it possible, through "shift reaction," to obtain a chemical synthesis gas rich in hydrogen which, through subsequent processing, could be transformed either into methane--it would be redistributed in the public networks, or it would progressively replace natural gas--or into methanol or other substances--it would then become a feedstock for the chemical industry.

"While the Thulin experiment," specifies Pierre Ledent, "is an essential step in the development process of the underground gasification of very deep seams, it does not however foreshadow the methods of industrial exploitation." As a matter of fact, the exploitation method used at Thulin is a petroleum type method in which drilling takes place from the surface with the deflected bore hole technique. It has certainly proved itself with the development of deep sea oil exploitation. But, in the case of coal a much more sophisticated machine would be required, a kind of "smart mole" controlled from the surface, and which could stay within the thickness of a seam of coal and be directed, at will, to produce a tunnel according to a pre-established plan.

Unfortunately, such a machine is not yet available on the market. Consequently, an industrial level exploitation will require the use of a "mixed" method, in which bore holes connecting the underground gas source to the surface would only be used to inject gasifying agents and for the evacuation of the gas. The surveying of the deposit and the preparation of the mining site would be handled through a network of galleries on a virgin site, dug out by conventional mining techniques.

The fact remains nevertheless that the process appears to be probably profitable, specifically when compared to the gasification technique based on extracted coal. While it is true that the cost price of 1 megawatt hour of generated gas includes a larger protion of fixed costs (cost of preparing the underground gas source), the itme "coal" is reduced to nothing and the only consumption item listed within the cost price of gas is the consumption of the electricity necessary to produce the oxygen used as a gasifying agent. Thus, 1 megawatt hour produced this way could be 10 to 40 percent cheaper!

Belgian Brains, but German Exploitation

"You should also take into account," adds Pierre Ledent, "the extraordinary activating effect which the mass production of synthesis gas could have on

the European economy as a whole, by improving the balance of payments of the countries of the Community* and by stimulating the development of all the industires that could participate in the production chain created by this new form of energy: from the production of oxygen upstream from the reactors, to the production of methane, methanol, plastic materials and synthetic gasoline downstream.

Table: Various Methods of Gasification

		Belgo-German Method	
	Multiple Faces	Thulin Experiment	Future
Description of method of exploitation	Drilling networks, 20 to 30 meters away from each other, with connections for exploitations achieved between the feet of 2 bore holes, through the retrocombustion technique (so-called petroleum method)	Transposition of multiple-faces technique at very great depths and under high pressure, with, at a second stage, development toward long tunnels (so-called petroleum method)	Preparation of large size gas sources through mining work based on a network of galleries located below the deposit being exploited and gas removal through a small number of bore holes (100x-) (so-called mixed method)
Countries	USSR USA	Belgium	FRG
Depth	± 100 to 300 meters	860 to 960 meters	1,000 to 2,000 meters
Gasifying agent	Compressed air	1st stage: air + steam; 2d stage: oxygen + steam	oxygen + carbon dioxide
Power per face	2 to 20 megawatts thermal hours	15 to 25 megawatts thermal hours	200 to 250 megawatts thermal hours (per gas source)
Injection pressure	3 to 4 bars	45 bars	45 bars
Advantages and Disadvantages	-lack of impermeability of underground gas source; -interference with aquifers; -low thermal power	-better impermeability of gas source; -increased yield and productivity	-possibility of developing industrial size units

*Europe spends about 774 billion francs per year for its energy supply.

However, if the brain is Belgian, the exploitation will be German. As a matter of fact, a single coal conversion unit, based on the methods used in organic chemistry, cannot be profitable below a production level of 3,000 megawatts thermal (5 million tons of extracted coal), and the FRG is the only country in Europe, if not in the world, to have the required set of techniques at its disposal (production of oxygen; the washing of the gas; conversion of carbon dioxide; final purification; mining techniques at very great depths, etcetera). "I would have liked to turn underground gasification into a European affair," concludes Pierre Ledent, "but if some interest can be detected on the part of the English and the Dutch, the French seem to have a clear desire to go it alone. They seem more interested in gasification from extracted coal."

8463
CSO: 3102/296

SWISS PLAN 5 MW SOLAR POWER PLANT IN ALPS

Zurich CHEMISCHE RUNDSCHAU in German 19 May 82 p 3

[Article by RWD]

[Text] In the mid-1980's a solar thermal electrical power plant (abbreviated Sotel) with a 5 MW maximum output is planned for the high Swiss Alps. To accomplish this a consortium was established in 1980 which in addition to the Federal Institute for Reactor Research and the Emmen Federal Airplane Plant includes 10 prominent Swiss industrial firms. In the past 2 years basic questions about size, technology, planning and construction time as well as cost have been clarified.

100 m High Tower, 25,000 m^2 Reflector

At 5 MW the capacity has been set higher than for solar power plants already operational or planned for southern Europe. The Sotel technology is in accordance with the principle of the solar tower unit: A field of 500 helistats (automatically revolving reflectors) each with 50 m^2 reflecting surface concentrates the solar radiation on a steam generator which is located at the top of an approximately 100 m high tower; the steam drives a turbogenerator to produce current. Approximately five times the total reflecting surface is required in land area, thus about 125,000 m^2 wasteland.

Working out the construction-stage project should take 14 months. In the process the location will also be determined. Possible sites are in the cantons of Ticino and the Grisons as well as in the Bernese Alps. If construction begins in 1984 and if permit hurdles are taken in rapid stride, Sotel could begin test operations in 1986.

Economical Only by the Year 2000

The central question for this project with long-range goals is an economic one. At 1980 prices the 5 MW Sotel unit would cost 50 million francs, thus each installed kilowatt would cost 10,000 francs. If plant costs are estimated at 1 million francs per year, then each kilowatt hour in Switzerland, where an annual 1,750 operating hours are calculated, would

amount approximately to 1 franc; at 3,200 hours in sunny countries the costs for current would be cut approximately in half.

Starting from this still extremely uneconomical base, the consortium is also considering that: First of all, specific investment costs would have to be considerably reduced through mass production (to 6,000 francs for each installed kilowatt for 5 MW units). Secondly, the increasing capacity of the power plant would result in a diminution of production costs for current (for a 50 MW unit they would be only one-third as high as for a 5 MW unit). Thirdly, it is not improbable that the real prices of the conventional energy sources will increase 2 percent annually. The conclusion from all of this: Price-wise, thermally produced solar current should be competitive around the year 2000.

Basic Unit for Export

By that date at the latest there should be an active demand for solar thermal power plants, not so much in the Alpine countries as in the sunny countries. The consortium is, then, primarily hoping for an export market. If Switzerland could maintain its current 4 percent share of the world market, then that would mean annual export sales on the order of 300 million francs at the turn of the century. A prerequisite for success with exports is, to be sure, a basic unit at home, and that is Sotel.

Currently the consortium is looking for the 2.3 million francs required for the actual designing. The members of the consortium would like to begin the design work in the current year so that the technical know-how gained through Swiss participation in the solar tower power plant of the IEA in Almeria, Spani, does not become obsolete.

9485
CSO: 3102/341

BRIEFS

PILOT WIND-POWER PLANT--The Hague, July 7--The government today revealed a plan to set up between ten and 20 windmills for electricity generation as a pilot project. A decision on the type of mills and their siting will be taken before the end of the year, so that the windmill farm can go on stream in 1985, it said in a report. The government will pay half of the 35-million-guilder investment and the Cooperating Electricity Production Companies (SPP) will chip in the other half. The mills will have a capacity of between 0.3 and 0.5 megawatt each, the report said. Economics Minister Jan Terlouw told a press conference after today's cabinet meeting a decision on storage of surplus power production was not necessary as long as windmill generation remained below 2,000 megawatts, a volume not expected to be reached before the mid-1990's. [Text] [The Hague ANP NEWS BULLETIN in English 8 Jul 82 p 3]

CSO: 3102/384

MESSER GRIESHEIM PERFECTS AUTOMATIC ORBITAL WELDING

Paris INDUSTRIES & TECHNIQUES in French 1 Jun 82 pp 95-96

[Article by A. Colombier: "Entirely Automatic Orbital Welding Thanks To a Transistorized Power Supply With a 20 kHz Pulsation"]

[Text] Because of its great adjustment flexibility and its "purity," the tungsten inert gas welding process is used in advanced technologies--aeronautical, nuclear or space. Far from remaining constant during the welding operation proper, the intensity is generally pulsated. Its value ranges from the melting point to a value usually much lower. This succession of hot and cold periods is repeated several times per second and prevents the metal from running. This proves very useful to counteract the effect of gravity when welding on the ceiling or along a descending vertical. Until now, with thyristor and transducer power supplies, the pulsation frequency was low and the arc obtained inadequate for many applications.

The German welding giant, Messer Griesheim, has perfected a "MULTITIG" transistorized power supply for automatic tungsten inert gas welding, which uses direct current of up to 320 A. This power supply operates with a basic frequency of 20 kHz and is therefore suitable for aluminum welding. The device guarantees a constant useful current $\pm$ 1 percent above 100 A, and $\pm$ 1 A below 100 A, in spite of fluctuations which can reach $\pm$ 10 percent at the start. The arc intensity is continuous, or follows a descending slope with an inclination adjustable from 0 to 90°. The pulsation frequency can be continuously selected from 0.1 to 1,000 Hz, the pulses increasing from 4 kA/s to 2 MA/s. The range of the frequency band is such that the pulse edges can be adjusted from the softest to the strongest values.

The accurate control of the heat applied ensures problem-free welding during critical passes from the bottom into position. With a microprocessor-controlled computer and an orbital welding head, this supply source can be used for the automatic and precision welding of tubing, for instance in the construction of nuclear reactors. The orbital head is then mounted on a carriage which revolves around the tube at a constant speed. That speed, as well as the vertical and lateral displacements of the torch, the unwinding of the wire, the back-and-forth motions of the torch and the changes in its angle of attack are controlled by a motor with a high degree of precision. The sequences are reproducible.

Nine 45-Step Programs

For work in position, the computer can provide a programmation of the power supply in sections corresponding to the different positions. When there are no more than six steps, the time, the basic current, the pulse current, the rectilinear slope (time required for current transfer), the length of application and the power of the current used to preheat the sheet metal, as well as the timing of the pre- and post-currents for the protective gas are programmed. An intensity recorder is used to document the cycle. Established welding programs can be recorded on a punched tape and reused whenever required. The system has been field-proven on several nuclear construction sites, for the orbital welding of very thick CrNi steel tubing, under difficult working conditions (little room to install the tubing). Its profitability as well as the excellent quality and the reproducibility of the welding in position have been demonstrated.

Another computer, Model G 04, makes it possible to enter, display, memorize and read 9 programs of up to 45 steps. For each step, up to 20 parameters can be selected. The succession of the sequences is controlled as a function of the distance travelled or the time elapsed. The programs are entered on a keyboard; the parameters of the current cycle, of the previous and of the following cycle are displayed on the screen. The programs are recorded on cassettes and printed for control and documentation purposes.

Jointly with this computer, a head control (MOK 43) can pilot two orbital heads, or welding guns or tongs, as required. For one of the orbital heads (OK 2), the control involves the carriage motor drives, the unwinding of the wire, the vertical displacement of the torch, the oscillation, the angular and lateral displacements, and the oscillation amplitude and the wire angle. This head, provided with a belt-driven carriage, is more specially intended for the precision welding of thick tubes, of diameters larger than 200 mm, in close quarters.

Up to 28 parameters measured at different locations can be simultaneously displayed in various colors on the display screen. The measurement values are shown as rows of percentages. The tolerances on the parameters can be programmed in increments of 1 percent. For subsequent processing, documentation and process control, analog output signals and non-potential contacts are available for each of the 28 channels.

The assembly can be connected to a welding simulator. This is a microprocessor-controlled resistor which can vary rapidly and is used to test power supplies. The device simulates an arc in a form standardized for all arc-welding processes, up to 800 A of direct current and 2,000 A of short-circuit current. It is especially useful to study drop transfer, trigger short-circuits, and arc-length variations. It records the dynamic and static operating characteristics. It will be used to develop new power supplies and for the quality control of series production, in short or continuous tests.

The investment required to purchase a MULTITIG system ranges from 150,000 to 200,000 francs. This system is not yet sold in France, but some 30 units are already in service throughout the world.

9294
CSO:3102/375

FRG MACHINE-TOOL RESEARCH CENTER 'BEST IN WORLD'

Paris INDUSTRIES & TECHNIQUES in French 1 Jun 82 pp 77-85

[Article by Andre Larane: "Aachen, a Mecca for Machine-Tools"]

> [Text] A flexible cell, a milling lathe, a power laser... A hundred spectacular, strange, or... confidential projects in progress. A new machine moves in or out every other week. A research center which is probably the best of its kind in the world.

The Germans are no longer the kings of the machine-tool. Very well. They have been outstripped by the United States and Japan. All the same, their Aachen laboratory remains the best in the world. In one particular field, that of mechanical engineering, it is ahead of the American MIT and leaves the French centers far behind. For these reasons, a report on their Aachen Technical Institute and its Machine-Tools and Industrial Administration Laboratory (WZL) was in order. We discovered astounding inventions. For instance, a combined milling machine/lathe which, unfortunately, we were not yet allowed to photograph. This combination of two machines as widely different as a fish and a rabbit will probably be offered to manufacturers in 1984. It is the most spectacular of all research projects, but several others offer greater technical interest. Approximately every other week, a machine moves in or out. Simultaneously, a power laser and a high-speed milling machine are installed, a water-spray cutting machine is moved and a press is disassembled. "Mechanical engineering progresses very rapidly. In order to remain dynamic, we cannot spend more than two or three years on a given project," Prof Wilfried Koenig states. "If a team were to exceed that length of time, we might forget it in its corner."

Some 100 projects are in progress. Some are dealing with fundamental research. They are financed by the Technical Institute (20 percent of the total) and by public funds from the Rhineland-Westphalia land or from federal ministries (69 percent). Others are carried out under agreements with industrialists and machine-tools manufacturers. Some others are the result of three-way agreements with companies and ministries. The Laboratory's 500 employees, a handful of whom only are involved in teaching, are working full time on these projects. But the premises also house job training facilities for workers. Of the 150 engineers, many are Aachen graduates preparing their doctorate. As one of them tells us, business hours are devoted to the projects. The

theses come second. This is why the workshop is still busy in the evening. But this overload of work proves profitable. Upon its graduation, a German doctor-engineer will receive over 10 job offers.

Lack of Fluency in English or German Too Often Causes Our Technicians to Ignore German Research

No wonder then if many students of the Paris Advanced School for Industrial Arts are in Aachen to work on their graduation report or to prepare a doctoral thesis. The principal of their school is quite glad to provide them with this additional training. But the exchanges of students are limited by the language barrier. Thus, a future graduate of the Advanced School for Industrial Arts admits that he had great difficulties mastering technical German. And yet, he is from Alsace. According to the Germans, language is the reason why the number of scientific communications sent to France is so low.

The exchanges of all kinds with Nordic countries or with the United States are said to be much more intense.

In France, in the machine-tools sector, researchers are glad of this lack of contacts. They are wrong. The results obtained by the Laboratory and the methods it uses, if they were better known, would enlighten the imagination of our reformists. The WZL has found a niche at the junction between university and industry. Overflowing with the 6,000 students of the Technical Institute, it profits by their abilities and, reciprocally, provides them the benefit of contacts with workshops. Thanks to it, the best brains are not afraid to engage in the study of machine-tools.

Four Heads That Agree

In France, CERMO (Center for Studies and Research on Machine-Tools) is comparable to this structure, because of its connections with the industry and with the School for Industrial Arts. But we must recognize that many Machine-Tools Plans will flow under the bridges before they reach the German dimension. The WZL is "monstrous." It has four heads which share the projects between themselves. These are the Chair of Production Engineering, the Chair of Manufacturing Technology (tools, cutting, forming...), the Chair of Machine-Tools (study of structures...) and the Department of Metrology. Why were the metrologists not given the honor of a chair? In practice, a few projects are managed jointly by two or three of the heads. The strict breakdown given above is, therefore, somewhat arbitrary. Nevertheless, it is made necessary by practical considerations. The Laboratory occupies an office building on the university campus and a 3,200 square meter workshop.

A Wardrobe for a Robot

In Prof M. Weck's department, the star billing is given to a flexible cell with two handling robots. It is connected to numerous projects, such as form recognition, a prehensile system, a direct numerical control. On one side, two lathes and a stack of rough and finished parts. Between the machines, a robot on rails. It transfers half-finished parts from one station to the other and discharges them. On the other side, a machining station. In the middle, an articulated arm with six degrees of freedom manufactured by Volkswagen.

A Clamp for Each Use

The robot brings the part to the machining station. When the work is completed, it removes it and takes it to the check-out, under a camera. The camera also helps the robot grab an object. After analyzing the image, the computer informs the arm of the adequate position. The optical treatment is quite long, of the order of 30 seconds. Fortunately, the camera goes on working without waiting for the computer. Each cell component (camera, robots, machines) is provided with its own control. The computer room is involved only with the overall management. Ulrich Dern, a young engineer, is perfecting a software model adapted to this type of direct numerical control. In addition, the Chair of Machine-Tools is experimenting with an automatic clamp-changing system. Before starting on a batch of a different shape, the robot strips and choses the appropriate clamp in its wardrobe. A study on how parts are grabbed has led to the use of four inductive sensors on each hand. They check the position of the object and order the robot to start all over again if the position is wrong.

Professor Weck's team is also engaged in basic research on machine-tools, such as the dynamic behavior of structures, using a Fourier analyzer. The operator simulates an excitation of oscillations and observes the weak points on the screen. In statics, the thermal variations of bearings is studied. When subjected to an artificial load, their temperature tends to increase. In acoustics, an anechoic chamber receives very large machines. Several German and Belgian gear-box manufacturers have joined to order a study from WZL. We saw the results: side by side, the old and the new gear-box models. The latter is based on measurements made in the anechoic chamber to reduce noise. This type of cooperation with the industry is remarkable. Do you know many manufacturers who could forget their rivalries long enough to carry out joint research? The Chair of Machine-Tools frequently cooperates with Professor Koenig's Chair of Manufacturing Technology. For instance, to measure stresses along the three dimensions of a milling machine. These tests in progress involve the structure of the machine as much as the machining process. Like his colleague, Professor Weck does not neglect grinding. One machine is provided with electronic sensors which monitor the work in progress.

The researchers analyze the quality of the contact with the grinding wheel. They like to say: "No two projects are alike among the hundreds which are carried out at one time or another... But each of them adds to our experience."

Profitable Super-Abrasives

Secret though it may be, let us now talk about the milling lathe, a horizontal lathe on the carriage of which a cutter with several teeth is replacing the carbide bit tool. In operation, the part and the tool spindle are both rotating. Heyligenstaedt, the German manufacturer who originated the project, asked the Chair of Manufacturing Technology to study the combination of the two motions. Since a shock occurs every time the material is attacked by one of the cutter teeth, the final surface finish leaves something to be desired. If this disadvantage, as well as the problem of programming all the motions, can be overcome, the machine will offer a metal-removal rate and a sophistication of forms out of the ordinary.

Is Milling on Its Way Out?

According to Prof Wilfried Koenig, head of the Chair of Manufacturing Technology and director of the Fraunhof Institute for Production Technology, most research is now devoted to grinding. "We want to replace 'high-speed grinding' by 'high-efficiency grinding.' Our super-abrasive grinding tests show that this technique can compete with traditional milling." Here, a cylindrical grinder is producing twist drills. The tool used is a grinding wheel with cubic boron nitride inserts. Professionals might be tempted to scream. In France, this super-abrasive material is judged too expensive and is not used much. If they knew! Mr Koenig predicts no less than a fivefold increase in productivity, taking investments into account. Initially, WZL observed a trend toward smaller batches and series in mechanical engineering. As a result, frequent variations in tool geometry, especially in drill geometry, were becoming necessary. Therefore, a more flexible fabrication method had to be found. Usually, the part is milled, then heat treated, and then ground to the required finish. Each operation requires adjustments and handling. With a single grinding operation on a numerical-control programmed-displacement machine, the flexibility desired can be achieved. For a depth of 4 mm, with a speed of 20 m/s and a feed motion of 2.75 m/mn on the grinding wheel, the machining time is reduced more than tenfold. Thanks to an extremely powerful 60 kW machine which costs hardly has much 2 milling machines. A comparison between cubic boron nitride (CBN) and traditional abrasives also yields spectacular results. According to WZL, with conventional abrasives the metal-removal rate is less than 1 $mm^3/m^3/s$. With CBN, it is 180 $mm^3/m^3/s$. With a high feeding speed, 620 $mm^3/m^3/s$ can be achieved. And the researchers guarantee that no changes in the structure of the metal take place. The contact zone remains cold. But WZL had to adapt a special lubrication device which sprays 150 liters per minute under a pressure of... 19 bars.

Another radical change: the size of gears, an important sector of German activity. Contrary to France, where no manufacturers produce this type of machine. WZL proposes to replace the traditional method of metal removal by cold forming. The advantage would be that less noble, i.e. less expensive metals could be used. Also, there would be no loss of material. Some truck gear-box manufacturers are interested in this prospect. Cold-forming with compression by a knurled tool would result in surface hardening of the metal and, therefore, more ordinary metals could be used. In the same perspective, researchers are working on a cold-molding Schuler press.

A Return to Adaptive Control

In electrical-discharge machining (EDM), Professor Koenig presents an interesting adaptive control experiment. "A luxury 20 years ago, a reasonable project today with the electronic components now available." On a travelling-wire EDM system, the objective is to extend the tool life. This is a recent and highly empirical technique. On the one hand, the German engineers must experiment by trial and error with different types of materials. On the other hand, they use micro-electronic techniques to prevent the wire from breaking, a costly incident both in time and money. Their adaptive control monitors the physical

parameters of the wire. It receives signals produced by force sensors and, whenever the wire threatens to break, it modifies the operating conditions. We shall follow up on this. This device might be on sale at some future machine-tools show.

German Manufacturers Do Not Hesitate to Lend Their Best Machines to WZL

Analyzing the Shape of Chips

However, similar tests carried out on a lathe will never be published. That system is used exclusively by a carbide bit manufacturer. Based on the lifetime displayed by the operator, the experiment consists in defining the best machining parameters for each cutting tool. A microprocessor measures the forces exerted on the bit and analyzes the shape of the chips. Piezo-electric sensors integrated to the machine transmit the signals. The electronic control then carries on a dynamic self-regulation. Still in regulation systems, WZL is studying the orbital motion of electrical-discharge machining systems. This rather recent device is not well known. It uses a simple electrode, the wear of which is corrected by a steady motion of the table. The Laboratory is attempting to optimize this motion so as to avoid, for instance, short-circuits in angles. To do so, it varies the speed and the pulses coming from the generator. The workshop also includes an electrochemical machining system. This process, again, is not much used in France because it is expensive, polluting, and difficult to use. The equipment costs 1 million marks. But it is suitable to the machining of difficult shapes and materials, for instance to drill long thin holes into diamonds.

As we already said, there is plenty of sophisticated equipment at the Laboratory. To the point of saturation. Expansion of the workshop will soon start, to accomodate the power laser now being installed. This laser, intended for the metallurgical analysis of cutting and heat treatment, will supply a power of 3 kW. It is modular, which means that when more room is available, two more identical units will be added to produce a total power of 9 kW at the end of the line.

Next to it is a water-spray cutting machine used for most non-metallic materials. Through a ridiculously small nozzle, the fluid is expelled at 900 m/s under a pressure of 4,000 bars! Several parameters are analyzed, among which temperature, nozzle diameter, distance between the nozzle and the part. The engineers are wondering. There is no theory to explain what happens between the part and the water spray.

Toward High-Speed Milling

But in order to improve cutting quality, they have already proved the existence of a dispersion of the spray resulting from the wear of the nozzle. Like the laser, this machine in fact belongs to the Fraunhof Institute, headquartered in Munich, which is represented here. Twenty of its employees are already working at WZL; they will be 100 next year. The last acquisition of the Institute is a two-spindle milling machine, one of them a high-speed spindle. It can reach 30,000 rpm, with a feed velocity of 6 m/min. Comparable

models exist at MBB (Messerschmidt) and VFW [United Aeronautical Works] (Fokker). After our review, Professor Koenig smiles when we ask his opinion on WZL compared to other technical centers. "Well, what do you think?"

Flexible Workshop: No Preconceived Idea

Messerschmidt's flexible workshop in Augsburg is somewhat like WZL. Two or three years ago, Prof W. Eversheim's Chair of Production Engineering prepared an investment planning and a simulation of tool requirements. The plant, where the fuselage for the European Tornado aircraft is machined and assembled, is famous for its high degree of automation. A network of computers coordinates all the flows: the parts being machined are on wire-guided carriages, the pre-adjusted tools on an overhead conveyor.

Further Progress in Computer-Aided Design

The optimization of machine-tool use is reflected in other experiments. Today, the team is studying the production of spare part by an automobile manufacturer. The same machines are used to produce widely different series. The major problems encountered have to do with tool management. Why do large companies ask WZL to carry out such studies? "They do not always have adequate simulation means," comments Professor Eversheim. "And above all, they know that, in Aachen, we work with an open mind and without preconceived ideas as to the choice of equipment." The professor is using the experience gained on the flexible cells shown at the Burckhardt & Weber booth at the 1981 Hannover Machine-Tool Show to prepare a project for the American company Cummins, a manufacturer of large Diesel engines.

Computer-aided design is another facet of his activity. His engineers have developed a software to reduce form definition to a minimum. It is no longer necessary to list lines, points and angles. The indication of the shape--"cylinder" for instance--is enough. But problems have arisen, among other things in distinguishing between hollow and solid volumes. American aircraft manufacturers are cooperating with WZL. Since 1978, Detail 2 software has been adopted by some 10 companies. But Professor Eversheim does not get involved in marketing. He prefers working on the extension of his system to manufacturing. His objective is to computerize technological data and machining instructions. Autap NC, a software to assist in programming skewed surfaces, has already been developed.

These various research projects are supported by quite a lot of equipment. The central CDC Cyber 175 computer is shared by several institutes. It has 1,250 kilobytes of memory and 700 megabytes of disk units. Around this unit, there are two 32-bit minicomputers, a few tabletop computers and quite a crowd of microcomputers. The specialists can judge...

This network is used for designing, for programming on numerical control tape, for static or dynamic behavior simulation and, last but not least, for the simulation of flexible cells.

However considerable these tasks may be, the network capacity seems safe from saturation.

Laser: Measurements to 0.1 Micrometer

Prof T. Pfeifer's Department of Metrology represents above all sophisticated equipment at the service of all departments. Among other things, three laser interferometers, two Fourier analyzers, a Zeiss three-dimensional measuring machine. In the climatized room, researchers measure a drill to 1 micrometer. In France, you would call that taking a sledge hammer to crack a nut. But why should the fabulously wealthy Laboratory do without?

To say the truth, some of this equipment is on loan from manufacturers for research contracts. The measuring machines are used to analyze procedural errors, the data required for the geometrical definition of a part, and the precision. Following the trend of the day, the department is interested in electronic sensing devices of the Renishaw type. It studies their use on machine-tools. In the workshop, on a Maho machining station, such an instrument can replace a tool. It provides the station with the capabilities of a measuring machine. A trainee detects the positioning or geometry errors induced by the machine or the initial setting of the tools.

He wants to achieve a self-compensating system which would improve machining precision without the assistance of a human controller. The orientation of this research demonstrates the interest of German manufacturers for the integrated control of machine-tools. Without it, automation is not possible.

Up to 60 Meters

Laser is becoming increasingly important. This is due to the frequency of linear and angular measurements in mechanical engineering. Now, the laser interferometer is the tool best suited to this type of checking. It guarantees a resolution of less than 0.1 micrometer and can measure up to 60 m. At WZL, it is used on machines to compare real and displayed dimensions. Also, it is used to check straightness, planeness and orthogonality.

In quality control, the researchers achieve a precision equal to that of top-of-the-line electronic comparators. They use solid-state image converters and, more generally, contactless optical sensors associated to a microprocessor. But these laboratory jewels are not working alone. They are dependent on adequate data-processing for which the Metrology Department collects data banks. Today, there is a trend toward decentralized networks, one of the first models of which in the FRG was built with the assistance of WZL. The instructions are distributed by the master computer to the computers of each piece of equipment, and carried out independently. For the final compilation, the measurement analyses go back to the central unit. A very high level programming language is used with such systems. It is Pearl, a software which is adapted to the working methods of the controllers and in keeping with the capabibilities of the minicomputers. Let us mention that a three-dimensional measuring machine is just as complex to handle as a numerical-control machine-tool. This is what makes computer assistance interesting. The Laboratory has also developed a programmation-assistance software, NCMES [expansion unknown]. This software is independent of the type of computer used with the measuring machine. In short, the problems of metrology are similar to those of the other departments, whether with respect to the data processing network, to machining precision, or to the structural quality of the machine. There is no compartmentalization.

9294
CSO:3102/373

ASEA TURNS EFFORTS TO TURNKEY MANUFACTURING CELLS

Paris INDUSTRIES & TECHNIQUES in French 1 Jun 82 pp 25-28

[Article by Andre Larane: "Robots: A Trend Toward 'Turnkey' Systems"]

[Text] Rather than going for an articulated arm mechanism, ASEA directs its efforts toward "turnkey" cells.

It is possible to plan manufacturing 800 robots in 1982, twice as many as in 1981, and still have no connections with the machine-tools sector. This is the case of ASEA [Swedish General Electric Corporation]. The Swedish giant is the 10th electrical engineering company in the world; the 4th after General Electric, Siemens, Hitachi, if taken together with other Swedish companies in the same sector: Electrolux (white products) and LM Ericsson (telephone). ASEA means both the high-voltage converters of the Itaipu (Brazil) dam and nuclear power in Sweden. It is also the only company to have developed a pressurized water reactor independently from Westinghouse. And for the past 10 years, it has been involved in robotics.

The latter has a prehistory since ASEA flatters itself to have been the first non-American user of a robot (Unimation). That division is in favor with the present management. It is much more dynamic than the electrical products division, and can look forward to a sustained expansion. In France, for instance, ASEA maintains an office employing 14 technicians and a testing center at Persan in the Oise department, although only some 50 robots have been installed. Obviously, ASEA expect a rise in the demand... which it had overestimated initially. Contrary to manufacturers in other western countries, the French seem to respond slowly to the shock of robotization. Should we attribute this delay to psychological fears or merely to a drop in investments?

It is all the easier for ASEA to provide massive support to its robotics division as the latter does not amount to much: hardly 300 people at headquarters out of a total of 56,000. Like most plants of the group, it is located in Vasteras. This medium-size town, some 100 km west of Stockholm, is therefore considered to be the Mecca of Scandinavian technicians. The robotics division has been independent for a few months; before that, it was an appendage of the electronics division which, among other things, manufactures numerical control cabinets and, of course, continues to assemble the boards and cabinets for the robots. In a 5,600 square meter workshop, some 100 workers are busy assembling manipulator arms, carrying out tests and shipping products. Another 100 people are working in the engineering and design department. They are modifying the line of products and, above all, solve the trickiest layout problems. The last third of the personnel is engaged in sales and relations with customers.

Surprisingly, the products themselves have not changed much. An adaptation of electronic characteristics to the recent progress in the field of components is impending. As for the mechanical characteristics, Pol Peny, in charge of the French market at Vasteras, insists that there is no reason to change them except for details. All robots include a rotating pivot to which a forearm that moves radially and an arm that moves vertically are attached. The wrist can move both in rotation and vertically. This amounts to a total of five degrees of freedom. A sixth degree is optional: on the smaller model, it is provided by the addition of a rail translation with a capacity of 6 kg under load; on the larger model, by the addition of an appendage to the wrist, with a capacity of 60 kg. On the larger robot, the six axes are used mainly for spot welding, on the model which the manufacturer calls IrB-60S.

International Components but Home-Made Tools

Because of its traditions, ASEA has oriented itself from the start toward all-electric robots. Each of the five or six axes is controlled by a motor. The movements are transmitted by small connecting rods. Other manufacturers use flexible chains which may be less reliable. Lars Erik Ringstrom, the technical manager, justifies his preference a posteriori by comparing it with a hydraulic system. "No cumbersome refrigeration unit, less power consumption, and an easy--even pleasant--maintenance." In any layout study, the importance of the first criterion is unquestioned. To serve several machines and a parts loading/unloading station, the robot is limited by its reach--about 2 meters--and its operating range--about 330°. The useful space, therefore, cannot be further reduced by accessories. From this point of view, the possibility of moving the control cabinet of the Swedish robot up to 15 meters away is appreciable. As a counterpart, it is obvious that an all-electrical system is less suited than a hydraulic system to the handling of heavy parts. Our industry is concerned. The motors for the axes are supplied by the French company CEM [Electromechanical Equipment Company], whereas the resolvers come from the United States and the gear boxes, alas, from Japan. All components, whether purchased or subcontracted to other divisions of the group, are sent to the workshop to be assembled in series.

In order to place itself among the leading robot manufacturers, the Swedish company has decided to develop a limited line of standard products. But it is concerned with maximizing its application range. After buying a brand of simple manipulators, ASEA considered a model with greater reach and lifting capacity. As a result, production increased steadily. But the assembly line remains very Swedish in its appearance. No frantic activity, no stress are noticeable. Some believe that this reflects a refusal to get involved with the work. That is not so sure... Assembly takes place in batches of a few units. In one corner of the workshop, the pivots are first assembled. Further, the arms and the control mechanism. Each electronic or mechanical subassembly is the object of a partial test. The cabinets and the robots are subjected to a final 72-hour testing program. No spectacular automation in all that. But, next door, where the printed circuits for the arms cabinets as well as for other equipment are manufactured, the electronics division is operating a home-made robot to drill the plates. Its operation as well as the semi-automatic assembly of the components are coordinated by a central computer. The drilling

cell consists of two programmed three-headed machines. The number of plates they machine each time varies with the requirements. Following instructions from the computer, the robot takes plates out of the magazine and forms a complete batch on an available shelf. The clamp is provided with a special pin to separate the metal sheets. The same clamp also grabs new drill bits and loads the tools on the machines whenever a drilling machine has received the parts it needs. The previous batch is countersunk and then discharged by the robot. In the circuits assembly workshop, the indications of the type of component to be assembled and of their location is computerized. All samples are supplied on a partitioned tray. The lid being partially open, the hand can dip only in a given section. Prior to each operation, the computer causes the tray to rotate thus offering the necessary component to the worker. Above the working table, a movable light, which is also computer-controlled, projects a light spot on the plate. Its successive positions indicate the location of the components.

In this manufacturing process, the robot offers the advantage of working night and day. It constitutes buffer inventories. Should an incident occur when no supervisor is at hand, it is programmed to skip the current operation and, if possible, go on to the following. But there are applications more representative of the capabitilies of this type of equipment.

Lars Erik Ringstrom wishes to supply specialized packages, in other words turnkey cells. He is already doing so for arc-welding under an agreement with the Swedish firm ESAB [expansion unknown]. ASEA supplies a small capacity robot and the adequate software. ESAB adds the torch, the power supply and the control console.

Toward Improved Reach and Lifting Capacity

Arc-welding remains the principal market of ASEA, which has supplied 600 of the more than 1,500 robots now in operation.

The remainder breaks down between spot welding, machine-tools feeding systems, handling equipment and various processes such as the gluing and cutting of composite materials. Will turnkey cells soon be available to finish castings? In a room at Vasteras, a cell is being tested on a robot next to which stands a tool rack. As required, the robot arm grabs a plasma cutting torch or a fettling wheel. It then processes the part placed in front of it. All the while, a worker is discharging the previous part and loading the next one on another tray. As can be seen, standard accessories are adequate to finish a large variety of series.

Things are not as simple when it comes to machine-tools feed mechanisms. Each cell is different, either because of the shape of the parts, or because of the type and age of the machines. At Vasteras, in a motor production unit, ASEA assembled a robotized system consisting of a Georg Fischer lathe, two old numerical-control Cincinnati drilling machines equipped with capstans, and one control machine. On the feed belt, parts-carrying pallets are provided with screws to adapt them to several dimensions. They bring cylindrical flanges. With the two prehensile clamps of its hand, the robot removes the finished part from the lathe and deposits the rough part.

Articulated Arms Fulfill a Real Need in Welding, Machining and Foundry

To tell the truth, contrary to turnkey cells, this application offers the advantage of giving a new life to old machines at the cost of a few changes. In the aluminum casting workshop of the same plant, the whole stator manufacturing process has been automated with two robots. The stator components are cut from rough sheet-metal and stacked. A robot takes the stack to a press where a dummy axis is inserted in its center. The second arm transfers the whole thing to an aluminum injection press. The whole carcass of the stator is then molded around the stack. After cooling and removal of the dummy axis, the first robot palletizes the finished part.

The order of the operations--molding around the stator rather than inserting the plates into a premolded carcass--was adopted to make robotization possible.

At the Vasteras engineering and design department, Lars Erik Ringstrom is studying devices which will make the articulated arm into a truly intelligent machine. For instance, during grinding and deburring, sensing devices placed on the clamp will detect excessive thicknesses. They will transmit this information to the cabinets where the machining parameters will be modified accordingly. In addition to this adaptive control, ASEA is also interested in the optical recognition of the parts being assembled. The difficulty there is no longer to distinguish between black and white, but to interpret shades of grey.

Although extremely fruitful, this type of research is of no immediate interest to average manufacturers, but they should not forget that the articulated arms which exist today answer a real need in welding, machining and foundry. They are not mere toys to be shown on television or by automobile manufacturers looking for publicity.

9294
CSO: 3102/372

BRIEFS

IMAGE ANALYSIS IN MANUFACTURING--The Micro-Videomat device from Carl Zeiss, Oberkochen, can be used to measure geometric sizes, to position components, to recognize structural characteristics. The image analysis system--which could be seen in Room 4--is suitable not only for quality assurance but also for control in the manufacturing process. Components can be matched according to selected criteria, and with fairly large manufacturing tolerances rejects can be minimized. A TV camera serves as an optical sensor for the Videomat. Among the stock of standard functions is, for example, "Fill-in" whereby holes in parts are filled in by software operations, so that they are measured along with surfaces, or in counting, parts are simply counted as concave parts. The function "Threshold" serves to form the digital image. The analog image can be made binary by two selectable picture halftone thresholds; interesting image details can be singled out. [Text] [Duesseldorf VDI NACHRICHTEN in German 14 May 82 p 6] 9485

CSO: 3102/343

DORNIER BUILDS COMPOSITE-MATERIAL HORIZONTAL STABILIZERS

Duesseldorf VDI NACHRICHTEN in German 23 Apr 82 p 24

[Article by RCS: "Alpha Jet in Carbon-Fiber Construction--Composite-Material Horizontal Stabilizer Unit Matured to Undergo Flight Tests"]

[Text] A new technological era is about to commence in aircraft cell construction with the use of new materials, particularly carbon-fiber reinforced plastics (CFK). For more than 10 years Dornier has been working in the development of ultralight components which will be used for the German-French strike and training aircraft, the Alpha jet, or will be tested on it for application in future combat aircraft.

Following the CFK brake flaps, which are already manufactured in series, and the CFK side rudder currently undergoing long-term testing, an Alpha jet horizontal stabilizer unit of compocite fiber construction will undergo flight testing within a few months. This component was also developed by Dornier, Friedrichshafen, as part of the aircraft component and testing programs (KEL) sponsored by the Federal minister of defense.

The required trials for flight testing of this CFK primary component, which is the largest one so far built by Dornier, were successfully completed by late 1981.

In comparison to the light-metal version of the Alpha jet's horizontal stabilizer unit which already had an optimum mass, additional savings of 18 percent in mass were achieved by the use of CFK.

In cooperation with the German Institution for Research and Testing of Aircraft and Spacecraft (DFVLR) in Stuttgart, new production techniques have been developed (monolithic construction) utilizing the design potential of the CFK material. The new production techniques resulted in a reduction of the number of individual components from 215 (aluminum version) to 80 in composite fiber construction and from 5,000 to 1,200 connecting elements. Thus, assembly costs were drastically reduced.

Upon completion of the qualification tests which were conducted at IABG's (Industrie- und Anlagenbetriebsgesellschaft), Ottobrunn, the airworthiness of the CFK horizontal stabilizer unit has been demonstrated. Statistical and

dynamic proof--taking varying operating temperatures and component humidity contents into account--was demonstrated on a single horizontal stabilizer unit.

Flight testing of the horizontal stabilizer unit on the Alpha jet 03 prototype is scheduled for this year. Prolonged testing at actual operating conditions by the German Air Force is to be conducted with a larger number of elevator units.

Experience gained from long-term testing is to strengthen the confidence in the new construction, on the one hand, and provide findings for future component developments, on the other hand.

These tests and industrial flight test series provide the necessary basis of confidence in the scheduled large-scale application in series of composite-fiber structures for future aircraft.

At Dornier, the next step on the way to a "CFK aircraft" is the construction of a wing made of carbon-fiber reinforced plastic for the Alpha jet.

9544
CSO: 3102/318

RENAULT VEHICULES INDUSTRIELS REAL-TIME FLEXIBLE WORKSHOP

Paris L'ARGUS DE L'AUTOMOBILE in French 27 May 82 p 19

[Text] RVI [Renault Industrial Vehicles] is offering a new gearbox, the B 9. This synchronized system is designed to be used with top of the line engines of 220 to 400 ch [hp], with intake couples of 100 to 170 m.daH. At present, this system is being used on the GRH 235 6 x 4 and GBH 280 6 x 4 construction vehicles. It will gradually be extended to the entire top of the line.

The B 9 Gear Box System

The B 9 is a synchronized mechanical gear box with eight forward speeds, plus one extra-slow speed, and one reverse. It will be developed so it can be used for special services, required by changes in transport and in vehicle types.

Before being manufactured, RVI spent 7 years on research and testing of the system. It has traveled the equivalent of 15 million kilometers. Transporters have used 75 vehicles equipped with a B 9. It is designed to last for 600,000 kilometers.

The objectives in developing the B 9 system were:

a. Speeds should be synchronized for easier handling;

b. There should be an extra-slow speed for maneuvering and for exceptional efforts;

c. It should be compact so it can be mounted on vehicles with a very short wheel base;

d. It should be able to be fitted with an electromagnetic idle system;

e. It should be able to be equipped with different types of power connections.

The kinematic system of the gear box consists of three related mechanical units:

a. There is a main mechanical box with four synchronized speeds, using spiral-cut pinions, primary and secondary coaxial axles and an intermediate axle.

b. There is a third axle in the main box; this is used to provide an extra slow speed and reverse; this was designed to take up less lengthwise space.

c. There is an auxiliary box with two speed ranges, obtained by an epicycloidal reverse gear, which multiplies the four main speeds by two. This forms what is usually called a staged box.

The three crank cases are stacked axially.

a. The main crank case contains the gear shift, the main box with four synchronized speeds, the slow speed, the reverse gear, the direct or indirect manual shift control, the fork guide and locking system, the assembly crank case for the power system, and the oil pump.

b. The intermediate crank case contains the epicycloidal gear which doubles the range of speeds.

c. The back lid contains the double synchro to control the epicycloidal gear, with its pneumatic control jack and tachymetric connections. An alternate version can have the Telma Focal from 170 to 250 installed.

The materials used are:

a. For the main and intermediate crank cases, gray cast iron [cast iron no 2].

b. For the third crank case, an aluminum alloy or cast iron, depending on whether it is only a lid or is a support for the Focal electromagnetic system.

c. The axles and pinions are made of forged chrome steel.

The synchros with positively active floating rings oppose any maneuver when synchronism is not established. The gear can only be engaged when the pinions are turning at the same speed. They are made of stamped metal with a surface treatment.

The Flexible Workshop

As the B 9 system is quite unlike the systems made until now in the specialized plant at Boutheon, RVI had to set up a new production unit. It selected the real-time flexible workshop system.

The flexible workshop is an entirely automatic manufacturing system which can combine productivity and flexibility for parts being made in small and medium quantities.

For the construction of this workshop, RVI had three essential requirements.

a. Flexibility in volume. The volumes to be manufactured may change in quantity and in time. So the initial investment begun in 1979 called for a capacity of 70 collections of crank cases for gear boxes per day. A supplemental investment will be made in 1983, bringing the capacity to 100 boxes.

b. Flexibility in products. The design of the product may change because its development continues until it is put on the market, because it must be adapted to meet the needs of the market, requiring changes in options and variants, and because the original product can have other types added to it.

As an example, between the time the workshop was ordered and its opening, several modifications in products were requested by the research staff, and these were easily made.

In addition, two variants in the gear box are planned for the end of 1983. These will require supplemental machining of the main crank case and the making of a new part. These supplemental machinings will be introduced without any problems.

c. Flexbility in stock management. RVI wanted the adjustment time required for switching from one reference to another to be as short as possible in order to decrease the length of series and stockpiles.

Using the flexible workshop has completely eliminated adjustments needed for switching from one reference to another for the four parts now being made there. Now there can be a direct flow of work between manufacturing and assembly, which reduces the number of parts kept immobilized. The flexible workshop also provides a flexible response when machines break down. There are several types of identical machines in the shop. In addition, machining centers can handle all types of work done by other machines.

In terms of productivity, the selection of the machines and the optimization of their use mean that the investment has a cost comparable to that of a more conventional system, and operating costs are slightly less.

The Boutheon flexible workshop can be considered a worldwide first since this is the first such system in operation which is controled in real time, combining a daily production schedule with an instantaneous reaction to whatever happens.

It is also a first in Europe in terms of manufacturing, since it features complete automation with the use of robotic transport carts. This automation is increased by the automatic exchange of the battery racks.

We should also mention the development of the boring-edging machine which has horizontal spindles that can produce all types of cylindrical or spherical shapes.

One added advantage of this shop is that it takes only 4 hours to change production, instead of the 80 hours usually needed. This decreases the stocks on hand.

The Boutheon flexible workshop has a floor area of 3,000 m^2. It has seven digitally-controled machine tools with automatic tool changers. The entire facility is serviced by eight robot carts.

Three Renault subsidiaries took part in developing this facility: the Castres Mechanical Company, which served as prime contractor; the SEIV Automation, which provided the eight carts; and the Programmable Robots Company SMC, which provided the 25 programmable robots used in the shop. Investments came to 45 million francs.

There are now 15 people employed in the workshop, who start the operations and increase the rate of work. Most of them were hired from traditional occupational fields, and were trained in the digital control of programmable robots, industrial data processing, etc. They were given a total of 10,000 hours of training.

The Boutheon Plant

The assembly of the B 9 gear box is done in conventional shops of the Boutheon plant. This plant was set up by Berliet in 1970 to produce and assemble gear boxes, and now has an area of 30,000 m^2 under roof. This plant produces gear boxes which can transmit a couple of 70 to 170 m.daN; these are used in vehicles of over 15 tons, with engine powers of 180 to 400 hp. The current production is about 100 boxes per day, with three lines of gear boxes in production. In all, 570 people are employed here, and 100 jobs have been created since the beginning of 1980. The number of jobs should reach 700 in 1985, with a total production of 150 gear boxes per day at that time.

The industrial production of the new B 9 box and the expansion in the capacity at Boutheon required total investments of 300 million francs.

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CSO: 3102/347

END

JPRS 81508

11 August 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 115

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JPRS 81508

11 August 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

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ENERGY

FIRST OPERATING RESULTS FROM ALMEIRA SOLAR POWER PLANT

Duesseldorf BWK: BRENNSTOFF-WAERME-KRAFT in German May 82 p 250

[Text] Initial operating results from the 500-kW solar power plant in Almeira in southern Spain, which began experimental operation in mid-1981, are now available. The core of the plant is the receiver, which is situated at a height of 43 ms.* The highest temperature is measured here (270° C at the inlet and 540° C at the outlet). The thermal output of the receiver is 2.7 MW at a mass flow of natrium of 7.3 kg/second.

Interest was centered principally on whether the solar-specific components of the plant, the mirror field with its controls and receiver, were functioning as calculated. After the mirrors had been cleaned twice, the measured values agreed satisfactorily with the precalculations. Longer term observations will provide information about the problem of mirror contamination.

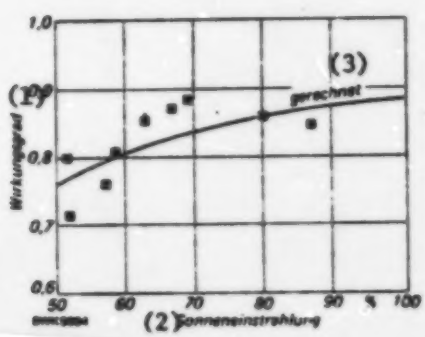

Figure 1. Receiver Efficiency--Calculate and Measured Values

Key:
1. Efficiency
2. Solar irradiation
3. Calculated

Figure 1 shows that the measurements of receiver efficiency exhibit some scatter, which can be attributed partially to the effects of the wind, but that the receiver is meeting theoretical expectations fully with respect to its thermal performance. The flexibility of receiver operation was confirmed: It can be turned as the sun, the mirror field or the rest of the plant require and, apart from the heating up and the subsequent filling with natrium, needs no special attention.

Separating the natrium circulation system from the water-steam circulation system has also proved itself. It is assumed that the independence of the two systems will simplify further operation considerably and will be of great advantage with changing irradiation or variable current requirements.

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*See: D. Stahl, H. Weizenkamp, H. Fricker, "Design of a Natrium-Cooled 2.7-MW Receiver for a Solar Power Plant," BWK [BRENNSTOFF-WAERME-KRAFT] 33 (1981), No 11, pp 451-454.

9581
CSO: 3102/363

BRITISH PLAN THREE MW WIND GENERATORS AT ORKNEY ISLANDS

Duesseldorf BWK: BRENNSTOFF-WAERME-KRAFT in German May 82 p 250

[Text] The Orkney Islands off the north coast of Scotland could one day become the wind energy center of Great Britain: The North of Scotland Hydro-Electric Board is planning the construction of several wind-powered generators of up to 3 MW here.

In December 1980 a 22-kW wind-powered generator began operation here, which had generated about 13,370 kWh for the island network here by March 1981--with an average output of 12.86 kW. The longitudinal-axis machine is eminently suitable for unsupervised operation and achieves a respectable output at wind speeds of between 5 and 40 ms/sec. Rated output is achieved at wind speeds above 13 ms/sec.

The next step in the program will see completion of construction of a 250-kW prototype model (20 ms diameter) by the end of 1981. The plant is the forerunner of the first 3 MW wind-powered generator (60 ms diameter), which has been planned for the same site--a 170-meter high rise, about 2 kms from the exposed north coast of Orkney Mainland. The 250-kW plant uses a double rotor blade arrangement and will reach its full output at wind speeds of between 17 and 27 ms/second. The prototype is being built jointly by the Wind Energy Group, GEC Power Engineering and British Aerodynamics, with the assistance of the British Ministry for Industry and the Hydro-Electric Board. Estimated costs are about 1 million pounds sterling.

The 3-MW plant is to be ready for operation in 1983-84. About 5.6 million pounds sterling are being set aside for it, according to the terms of the financing plan; the British Ministry for Energy is assuming 4.6 million pounds sterling of the cost, and the Hydro-Electric Board is contributing the remaining million pounds sterling. The 3-MW machine is designed as a twin-rotor blade machine, with a longitudinal axis. The rotor blades are rigid for 80 percent of their length, the outer 20 percent can be continuously trimmed to control power output. The machine is designed for 30 revs/minute at wind speeds between 8 and 27 ms/second and for a rated output of 3 MW at wind speeds of 17 to 27 ms/second. The rotor axis will be 45 ms above ground. This is one of the highest wind-powered generators built so far, with a height of 75 ms from the base to the tip of the upright rotor blade.

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CSO: 3102/363

ENERGY

INCREASE IN FRG FUNDING FOR ENERGY RESEARCH

Duesseldorf BWK: BRENNSTOFF-WAERME-KRAFT in German May 82 p 250

[Text] The "Second Program for Energy Research and Energy Technologies" was passed by the government after several delays. It includes all the measures in research, development and demonstration receiving government support between 1981 and 1985 in the area of energy. The second energy research program is marked by a substantial planned increase in subsidies. As usual, it is subject to the approval of the Federal budget each year and of financial planning. Taking the Federal budget for 1982 and financial planning until 1985 as a basis, and including expenditures for 1981, more than DM 12 billion will be spent on the program from 1981 to 1985. That means funds have been almost doubled compared with the first program (1977 to 1980).

The financial dynamics results from sharply rising investments in the rational use of energy (1981: DM 155 million, 1985: DM 230 million) and principally from the substantially increased funding for coal conversion, which is set to increase from DM 96 million last year to DM 835 million by 1985; most of this will go to coal gasification (1982: DM 166 million, 1985: 672 million). The Ministry for Research and Technology points out that in the area of coal conversion the expensive phase of demonstration and prototype plants is just beginning in the 1980's, to prepare the way for large-scale technical utilization.

By contrast, state supported research for prototype and demonstration plants, particularly in nuclear areas, will come to an end during the 1980's, affecting, for example, uranium enrichment and--with the start of operations of the THTR [thorium high-temperature reactor] 300 and the SNR [fast breeder reactor] 300--the Advanced Reactor Lines. Their continued development, as was announced in the Third Assessment of the energy program, will have to be taken over by the industry. The energy research program provides an increase for the Advanced Reactor Lines this year from DM 701 million to a total of DM 808 million in 1985, but the funds just for high-temperature reactors are falling from DM 298 million to DM 226 million in 1985.

Support for renewable energy sources is being continued. It is intended to benefit not only German energy supplies, but also to create solutions for the Third World and open up chances for exports.

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CSO: 3102/363

BRIEFS

SWEDISH WIND POWER--Sweden is investing in a new generation of wind power plants. Vattenfall and Sydkraft will give Kamewa and Vindenergi respectively the task of developing a new generation of large wind power plants. The work means that Sweden is improving the conditions for maintaining its international leadership in the wind power field. This can also mean that power companies will not wait for the Riksdag energy decision of 1985, but will order wind power plants in 2 years, in 1984. After one year's deliberations the parties concerned have reached an agreement which in brief looks like this: The government will contribute 5 million kronor. This amount will go via the wind scientists at the Agency for Energy Production Research to Vattenfall, which will give Kamewa the task of adapting the prototype power plant which is to be put into operation at Nasudden on Gotland in the fall. Vattenfall will invest one million and Kamewa 2.5 million kronor. Sydkraft will give Svenska Varv/Vindenergi the task of adapting the Maglarp prototype in Skane which will be put into operation in the fall. Vindenergi will also invest 2.5 million and Sydkraft one million kronor. In 1983-84 the foundation will be in place for determining the economic and technical preconditions for wind power. The arrangement means that the power companies will have the basis for decision earlier than was planned by the politicians, and that the export possibilities of the Swedish industry are improved. [By Mikael Holmstrom] [Text] [Stockholm NY TEKNIK in Swedish 3 Jun 82 p 2] 9287

CSO: 3102/390

AUTOMATION FOUND THROUGHOUT PLASTICS PROCESSING INDUSTRY

Paris L'USINE NOUVELLE in French 3 Jun 82 pp 94-98

[Article by Pierre Laperrousaz: "Plastics Processing: 'Fully Automated' Tomorrow"]

> [Text] Computer-aided design, automated tool manufacturing, robots for secondary tasks (unloading, sprue removal)... Management by a central computer. A utopia? No, these techniques already exist. All the plastics processors have to do is use them.

What will a plastics processing plant look like at the end of the present decade? What tools will help the processors maintain their competitivity? According to Jean Laurent, assistant general manager of SMTP[expansion unknown]-Billion, "tomorrow's industrial complex will be ruled according to three principles: quality, reliability, flexibility."

Quality means the optimization of parts geometry to ensure service performances, the use of a minimum of material, and optimum molding conditions. To achieve this difficult operation, the processor will have one tool at his disposal: computer-aided design (CAD).

Reliability means that the quality obtained will be maintained in spite of increasing processing rates; the answer will lie in automation and robotization which eliminate the disruptions due to the human factor.

Flexibility of processing will become mandatory in view of the increasingly diversified requirements of the clients and will require an extremely versatile tool: the flexible workshop.

Equipment manufacturers, control engineers and computer specialists are already making plans. In the design department of the plant of the future, the parts are designed and drawn by a computer which also determines their molding conditions as a function of the processing capabilities of the enterprise. These numerical data are transmitted to the production department. They are fed into the numerical controls of the machines which manufacture the tools (data on part geometry) and to those which manufacture the parts (molding parameters for injection presses, for instance). In this processing workshop, the production

tool itself is supported by all conceivable sorts of peripherals which make it into a flexible workshop: centralized raw material feeding system, manipulators to extract the parts, and even more sophisticated robots to carry out secondary tasks (sprue removal, assembly, palletization, etc.), automatic mold changing devices, automatic quality control stations, etc. A central computer will manage all the machines and collect from each of them the data necessary for production management (operating rate of the machines, number of parts produced, rejects, etc.).

These various stages in the production of a part do not necessarily take place at the same location. A client may well design his part and the tools required, then enter the digitized data on any medium (tape, diskette), or even transfer them in real time to the toolmaker or to the molder.

A utopia? Most of the "building blocks" for the construction we have just described are already available (besides, not all processors will need every building block). Thus, for CAD, numerous softwares have already been developed for metallic parts and could be used for plastics. In tomorrow's plant, the computer will aid in designing the parts as well as in designing the tools. This will take place in a closed system where successive iterations will be used to determine the geometry that will meet the part specifications with a minimum use of material, and to define optimum molding conditions. The advantages are many: savings of time at the design department, no unpleasant surprises when the mold is put into service, savings of material, as well as cycle time reduction (since the cooling time of a part is proportional to the square of its thickness). In addition, thanks to the powerful performance of CAD, the designer can always examine several solutions or variants of the same part simultaneously, or make last minute changes. Now, as John Wood of General Electric Plastics Europe points out, "when the first 5 percent of the development work on a new product are completed, 85 percent of the product characteristics, performances and costs are determined." The first stages in part design are therefore extremely important.

At present, only a few examples of CAD-designed plastics parts are known: the brake pedal of the Vera, an experimental vehicle of Peugeot, is one of them. And whereas a system like Moldflow has had the merit of making users aware of the importance of mold design, it represents only a first approach which could be improved in many ways. At any rate, there are still no closed part-design or mold-design systems.

In this field, research takes place at several levels. At systems suppliers, of course, at users (especially in the automobile industry), and also at machine manufacturers. "It is impossible for a press manufacturer not to show any interest in the design of the part or mold, contrary to what is the case in metal fabrication," according to Jean Laurent who, for the moment, chooses to remain discreet on an important program now in progress in the plastics industry as a whole.

General Electric, a manufacturer of technical-grade plastics (with its General Electric Plastics subsidiary) and of data-processing systems (with GEIS [expansion unknown], SDRC [expansion unknown], Calma), owed it to itself to be represented at the last Europlastique show. It introduced a parts and tools CAD

system incorporating the various softwares available to the company (including Moldflow and Moldcool to design the rheological and thermal characteristics of the molds). This system provides directly the punched tape necessary to manufacture the pattern cavity. It also makes it possible to visualize (through shades of colors) the stresses induced in a part by a given load.

Another project illustrates what an integrated CAD system could be. This is the PROCOOP system (Capacity Software Packages for Plastics Objects and Tools), a project developed by ANIFOR (Association for Continued Training in the Plastics Industry) and CISI (International Data-Processing Services Company) as its technical partner. This project--the outcome of an inquiry with several tens of manufacturers--has received the support of ADI (Data Processing Agency). Jean-Marc Maucotel, the Association's manager, explains: "It is a modular chain system which, when used in its entirety, can cover all CAD and CAM [computer-aided manufacturing] tasks relative to objects and the tools they require (visualization of the flow into the mold during injection; mechanical and thermal behavior of plastics objects under conditions of actual use). Our objective is to place CAD/CAM within reach of small and medium-size enterprises by providing them 'a la carte' access to this system."

At first, the whole PROCOOP system will be offered on the CISINET network of CISI. Depending on his needs, the user will be able to use one or several sub-systems (computer-aided design, computer-aided drafting, flow, behavior, computer-aided manufacturing) or the system as a whole. In a second stage, it will be possible to transfer several conversational functions to the users' premises; depending on the means at their disposal and the importance of their needs, the latter will then be able to work entirely in remote-batch processing or to distribute the functions between central locations (CISINET networks) and their own premises. "We cannot expect to build everything from scratch," Jean-Marc Maucotel indicates. "On the contrary, we shall make maximum use of the softwares existing on the CISINET network to construct each of the sub-systems. For instance: Systrid for CAD, Condor for CAM, Castem, including Plexus, for the behavior of objects and tools and flow-visualization (motion, stresses, velocities, vibration modes, or buckling, response to impacts); Thermix for transient and permanent thermal characteristics (temperature map)."

If need be, these softwares will be linked automatically by interfacing and data-base modules. In addition, several of them will have to be adapted to take certain "molded" geometries into account, or to take into account the rheological models characteristic of plastics (thermosplastic, thermosetting, even composite materials).

Of course, it will also be necessary to create, then to manage, a data bank on plastics that will be integrated to the system and could also be used separately. This is one of the largest items in this project; the work involved in collecting, determining and controlling these data is enormous and it is not unreasonable to contemplate doing it on a European scale...

"We are preparing specifications for the characterization of materials," they say at ANIFOP. Assuming that PROCOOP is actually realized, the question will arise as to how to take into account other softwares developed elsewhere, especially in the automobile or aeronautical industries.

"We are in favor of the project," Raymond Gonard, of Peugeot's Scientific Design Department, says, "but we do not see as yet how we could link it to our system." Anyhow, the need expressed by manufacturers is real and a modern solution will have to be found.

Increased Number of Injection Molding Workshops With Central Computers

The non-linear mechanical behavior of plastics, with considerable deformations, will require an adaptation of the design methods to the elastic behavior of metals. And the problem will get only more complicated in the case of anisotropic composite materials!

Finally, much progress remains to be done in the automatic three-dimension interconnection into finite elements and in its automatic reactualization during the iterative design process. Not to mention compatibility between the various CAD systems now on the market. But these problems do not concern plastics only!

After it has been designed by the full power of computers, the part enters the manufacturing cycle. At this stage too, it will still be under computer care in the workshop of the future. A very near future since, less than a year from now, France will have several injection workshops where all the machines will be connected to a central computer in charge of monitoring and managing all of them.

In a centrally managed workshop, it is possible at all times to access a machine terminal from the central station in order to check the progress of the cycle, find out how production is progressing, check the adjustment program, etc., through a display on a video screen. The computer also provides a management function. For this purpose, it collects statistical data concerning:

- The machines: breakdown of time (production, downtimes, adjustments, miscellaneous shutdowns: mechanical, hydraulical, electrical). These conditions are identified automatically through programmation tricks or, if that is not possible, manually, through the keyboard.

- The molds: time of use, number of injections, average cycle time, proportion of rejects, etc.

All these data are of course very useful to maintain the production tool and manage production. But at present not all data are recorded automatically. For rejects, for instance, automatic control stations would be required, although, to a certain extent, self-adaptive controls (of the CPI [expansion unknown] or dK-Codim types)--which, for each injection, compare the actual profile with an ideal profile--can distinguish the good parts from the rejects.

Depending on the size of the enterprise and the data-processing means available, the central computer is used as a "preprocessor" providing data to a higher-level computer, or it is in charge of most of the production management. All manufacturers are making a point of offering systems which will permit all possible configurations. Thus, dK-Codim has just sold 9 presses equipped with

its Module 6 to Mecaplast (Monaco); these are intended for a workshop which will eventually include 30 presses (old and new) under centralized management. However, Mecaplast has not yet made a decision as to its central station configuration (the system also provides remote diagnosis for remote maintenance by the manufacturer).

The Ordimat system of SMTP-Billion is using as its central unit a PDP-11 (23 or 24) minicomputer from Digital Equipment which can easily be connected to a more powerful system. This company, located in Oyonnax [department of Ain], has developed on its own an operation software which, in addition to the mere gathering of statistical data, also ensures the management of technical production means (presses, tools, etc.), that of times, expenses and internal orders, and production follow-up. This is a true production management software which, for instance, makes it possible to check the feasibility of an order depending on the existing workload, or to find out the state of progress of an order, or again to modify a manufacturing program to take rejects into account, etc. The first such system will become operational in the fall of 1982 on a total of nine presses equipped with Visumat 4000.

This configuration, including a master computer and slave machines, each with its own numerical control, will prevail for a long time to come. "We do believe that process automation will remain at machine level, the central computer assuming only management tasks," Philippe Pertuis, of SMTP-Billion, says. The adjustment programs are entered through the machine terminals or transmitted from the central station. But the part played by the latter in machine control is restricted to on/off orders (which might be programmed). A schema of this type has been adopted for the system which CPI will deliver to La Telemecanique (seven machines managed by a central CPI-70 station).

Machine control in tomorrow's workshop will of course use microprocessor capabilities. The most recent of the systems available today are already giving a good idea of what it will be like. Compared with the first generation (1978), they have a greater processing power because they use a larger number of microprocessors. In the same way, sensing devices (infrared probes for material temperatures at dK-Codim, for instance) and hydraulic devices (systematic use of servo-valves) are better adapted. The displaying of adjustment parameters through the keyboard, their visualization on a color screen through synoptic diagrams, graphs, etc., and their storage in memory on various media (cards, reprogrammable read-only memories, bubble memories, etc.) for future production runs, make the user's task easier.

The closed loop control is replacing the so-called "open" loop control. "The debate as to which of the two systems is better is no longer relevant," Jean-Paul Bras, technical manager of dK-Codim, states.

Debate on Self-Adaptive Control

Another debate promises to yield exciting controversies: for or against self-adaptive controls? For the proponents of the latter (dK-Codim, CPI), the question is settled: why do without an improvement which, undeniably, provides a greater regularity in parts?

The self-adaptive control does in fact correct injection parameters during the cycle proper, depending on the deviation of the actual profile from an ideal profile. Thus, the small variations in viscosity due, for instance, to changes in the material or to a sudden temperature variation can be taken into account. "In some cases, we have noted an improvement by a factor of two or even five on the standard deviation of part weights," Jean Azarian of CPI states. And Ari Sayag of Mecaplast, who has purchased the competing device from dK-Codim, adds: "We could not manage to produce rejects, although we purposely introduced perturbations." But Philippe Pertuis disagrees: "But the most urgent task, if we want to improve the overall performance of the workshop, is not to aim at such a high level of automation. For our part, we choose to approach automation in the broader context of integration of the molding process with upstream and downstream operations." He admits that self-correcting algorithms are "operating" in the lab at Oyonnax. This view, maybe more realistic, certainly more prudent, is shared by other manufacturers, such as Battenfeld.

In tomorrow's workshop, the machine proper (i.e. the machine that forms the material) is only a sub-assembly in what we might call a production cell. Around it, a whole series of peripherals are operating; they may or may not be provided with individual automatic systems, but they are all connected to the machine control. They include manipulators for insert addition and/or part extraction, mold changes, sprue removal, assembly, marking, deburring, weighing stations, etc. The distribution of materials is centralized and their coloring automated, which reduces waste, handling and inventory. The mold-cooling system is also centralized. As at the new Mecaplast workshop which also includes six material-distribution circuits.

One such plant "without operators" is now being designed by Cincinnati Milacron in the United States, for the injection department of a multinational company. In this project, the operator in charge of supervising mold changes (the molds being brought on wire-guided carriages) is alone in the workshop. Another operator is in charge of the mold inventory. The control of finished products is also automated, thanks to a video shape-comparator. In fact, this plant is just a collection of technical means which are already available. Most press manufacturers are now working on a mold changer; some have already realized one (Billion, Battenfeld, Toshiba, etc.). Until now, the demand has not been very large, but this should change. Indeed, when the memory storage of adjusting parameters makes it possible to resume production within a few minutes, it becomes senseless to lose several hours changing tools. The manufacturers' design departments have re-examined the problem by studying automatic connection devices (mechanical, hydraulical, electrical) which are more reliable and adaptable, even on older tools.

At SMTP-Billion, the two halves of the mold are mounted on standard plates which carry the hydraulical and electrical connections (up to 16 conductors). Symmetrical plates are provided on the press plates, and the closing motion also closes the connections. Simultaneously, lateral jaws mounted on the press plates block the tools in position and the (central) ejector pin is locked on. For tool-safety reasons, the jaws are actuated by springs when they close and by hydraulic jacks when they open. "For the moment, this

quick mold-changing device is semi-automatic since the tools are still brought in manually, by a hoist. However, we are contemplating a fully automated system, where the tools will be introduced through the top of the press, or through the side, depending on the dimensions and size of the mold," Bernard Monet, development manager at SMTP-Billion states.

At Toshiba, such a system is already operational, as could be seen at the last Interplast show. When a given production run is almost completed, the press control module discontinues material-feeding to the machine ahead of time and, after the last cycle, triggers the change of mold. The mold is brought in laterally on a roller table. According to the same principle of rapidly starting new production runs, devices to preheat molds will be developed and, quite naturally, their design will be derived from that of previous systems. The concept of flexibility can be carried still further and "quite possibly, one day, we will design modular systems in which the plastification unit itself could be automatically exchanged," they say at SMTP-Billion.

Convincing Arguments in Favor of Robots

As can be expected, robots will be present everywhere in the workshop of the future. Their use has already been rehearsed on a few occasions, to unload injection presses at several French processing plants. Certainly, most of them do not deserve the name of robot. In fact, they are automatic manipulators with pre-adjusted cycles. They grab the parts by means of suction pads or clamps and extract them from the mold through simple motions, in most cases along Cartesian coordinates, with a few rotating motions (or "wrist" movements): enough to orient the part once it is taken out of the mold and place it on a conveyor or, more seldom, on a sprue-removal, marking, palletization device, etc. In the less sophisticated models, the sequence of motions is controlled by a simple logic, and the length of each motion is adjusted by means of stops, switches, cams, proximity-effect sensors, etc. The more advanced models are provided with a numerical control and follow a program recorded through a keyboard (and which can be modified at will). Less common manipulators are operating along "circular" coordinates: they extract the part through translation motions, then disengage it by a rotation.

Manpower savings, less rejects, increased production rates, improved safety, these are the arguments most often put forward by the proponents of robots: the manufacturers and, more convincingly, present users. According to Jean-Louis Moreau of Sepro, the only French manufacturer, "the reduction in downtime for unloading is especially noticeable with large presses (at least 300 tons), and when changing shifts." In some workshops, up to 40 minutes per day could be saved; generally, gains of 5 to 12 percent can be expected. These statements are confirmed at Allibert (Meru plant), where 12 Star Seiki robots (from Japan) have been in service for a few months already. On a 1,700-ton press, the rate of production has increased from 52 to 60 parts per hour, and the machine cost per part has decreased from 7.21 to 6.25 francs. Over a 5,000 working hours' period, the investment will be amortized in less than 9 months. In the same workshop, a pair of parts injected into two molds placed side by side on a 1,200-ton press are extracted: the elimination of 3 operators and the increased production rates make it possible to expect amortization within 12 months.

An additional advantage is that the almost total elimination of incidents when parts are extracted or discharged (provided the tools are designed accordingly!) reduces the number of rejects: less than 1 percent on a 1,500-ton press molding dashboards for the R-9 Renault. Indeed, as they explain at Allibert, "the molding cycles are so well optimized now that a prolonged shutdown of a machine, for instance after an extraction incident, almost certainly results in a reject on the next cycle." In this sense, the extraction manipulator fits quite well in the logic of a finer regulation of the injection process itself.

9294
CSO: 3102/387

NEW STEEL PELLET MAKING PLANT SAVES ENERGY, MONEY

Stockholm DAGENS NYHETER in Swedish 15 Jul 82 p 9

[Article by Caj Noren, DAGENS NYHETER's Norrland correspondent: "Cause for Rejoicing at LKAB: New Pellet Method Gives Competitive Advantages"]

> [Text] Malmberget. The "steel band process" is the name of the new method of making pelletized sinter from ore concentrate. The method is a world innovation in the mining industry, and was worked out by LKAB [Kiruna Mines] Mining Company researcher Roland Drugge at Malmberget. With the "steel band process" investment and construction costs for a pellet works are radically reduced. And while the "old" pellet work require giant facilities the "steel band process" can be built in all sizes and even be made portable between small mines!

The new method of making pellets has been tested for 3 months in a pilot installation at LKAB's old, inactive pit furnace at Malmberget. The results were called very promising.

"But before the steel band process can be used by LKAB in a new pellet works the method must be tested in a medium-sized works with an annual production of up to one-half million tons," said research engineer Roland Drugge, who is head of basic process development at LKAB.

Eight Million

Roland Drugge is a metallurgist, and also an expert on control and regulating techniques, knowledge which he has now put into practice. LKAB has invested eight million kronor in the new method which can give the company large future competitive advantages.

In a conventional pellet works the rolled pellet balls are transported to powerful ovens in a large number of heavy steel wagons which look like horizontal escalators.

The heavy material means a very large investment which demands large structures, and an extensive and costly foundation.

In the "steel band process" Roland Drugge has exchanged the heavy so-called roasting wagons for a 1.5 millimeter thick steel band. The technique of "baking iron balls" was taken partly from modern bakeries where buns are baked on steel bands!

In a pellet works they are dealing with temperatures of over 1300 degrees. In order for the steel band to withstand such temperatures Roland Drugge has found his own trick. The thin steel band is protected by a bottom layer of already roasted pellets, and furthermore the steel band is perforated with crosswise slits.

"In this way the band can withstand the high temperatures without buckling," said Roland Drugge.

The new "steel band process" is used with LKAB's energy-saving so-called warm front technique which is used in the pellet works at Malmberget and at the new KP 79 at Kiruna.

This technique has also been developed by Roland Drugge.

The warm front technique means that with the help of computers a "warm front" is created between the lower layer of already roasted pellets and the ore balls that are to be roasted.

"The hot gases are simply drawn in and transfer their heat in a sharp warm front to the bed of pellets on the steel band," said Drugge.

The fully automatic pellet fabrication is controlled by a computer. It only requires one person to watch over the process in a control room.

The pilot installation at Malmberget has a capacity of 50,000 tons per year.

"A natural size for this type of pellet works is an annual production of one million tons. But technically there is no upper limit to how large a works can be built," said Roland Drugge.

The investment cost for a pellet works has tripled during the last 10 years. Therefore it is necessary to build new installations which will produce at least three million tons of pellets per year for them to be profitable. That means an investment cost--today--of about one-half billion kronor.

One-half

"With the steel band process the investment cost will be halved," said Roland Drugge.

Such low investment costs in combination with the new warm front technique should, he believes, give LKAB decisive competitive advantages.

Today, for example, LKAB uses six liters of oil to manufacture one ton of pellets with the warm front technique. LKAB's "worst" competitor on the European market, Brazilian CVRD, uses 36 liters of oil to make the same amount of pellets.

LKAB has the total capacity to manufacture nine million tons of pellets per year.

This is only one-third of the firm's estimated future iron ore production. But today, because of the steel crisis, only about 70 percent of the capacity of LKAB's pellet works is being utilized. Still, Roland Drugge believes that in the long run LKAB must expand its pellet capacity "appreciably."

"I believe that LKAB will make pellets of all of our estimated production of 25 million tons per year. We are strong in pellets, and we can be even stronger in the future. We have a technical advantage, and a unique ability. This means that we can produce the market's best pellets at the lowest known oil costs," he concluded.

9287
CSO: 3102/390

SCIENCE POLICY

MINISTER SPEAKS ON R&D, STATE AID IN KEY TECHNOLOGIES

Duesseldorf CHEMISCHE INDUSTRIE in German May 82 pp 273-275

[Interview with Dr Andreas von Buelow, minister for Research and Technology, by CHEMISCHE INDUSTRIE: "Create Knowledge--Support Innovation"; date and place not specified]

[Text] CHEM IND: The yardstick of a responsible research policy must be long-term development trends. These are to be viewed against the background of competition in world markets by FRG enterprises. What possibilities does the Federal Ministry for Research and Technology (BMFT) have for observing and analyzing worldwide scientific and technical developments? To what extent do contacts with universities, scientific societies and other information sources constitute bases for evaluation of development trends and for decisionmaking?

Von Buelow: The political determinations of the main focuses of research and development policy rest, on the one hand, on discussions with the world of experts and [technical] society groups and, on the other, on analyses and predictions including the international situation and development. Possibilities for observing and analyzing worldwide scientific and technical developments and preparing these for research policy are extremely varied. In addition to analyses, predictions and reports worked out in-house, each year orders amounting to about DM 2 million are placed for the purpose of research planning. Besides predictions and analyses spanning several areas, synopses and evaluations in individual technology areas are significant. As a rule, these are carried out in enterprises, universities and scientific institutes. From these, proposals for the next research programs, main focuses of support, or applications for support are developed and sent to the BMFT. To examine such proposals and applications right through to a decision, the BMFT supplements its own expertise by drawing on project firms and outside consultants. These discuss and advise, usually in expert circles, specialized field and ad hoc committees whose makeup is given out in the adviser plan appearing annually.

CHEM IND: The FRG's chemical industry, as well as plant and equipment construction, rank among the technologically leading branches of their kind in the world. To maintain this position, however, constant research and

development efforts are required. These can exceed the financial capacity of a single enterprise or even of an entire branch of industry. Where do you see the field of application and the limits of government research support?

Von Buelow: Research and technology policy supports industrial research and development in those areas and tasks where the risk cannot be borne alone by business or enterprises and which are of advantage to our society. Where these conditions are met, that is, which areas of technology have become main focuses for support, is decided on the basis of the objectives of overall policy in which the research and development policy is imbedded. Today, for the first time, we are facing a challenge to remain internationally competitive through development and application of key technologies, e.g., microelectronics, biotechnology, optical signal technology and the energy technologies. In the intermediate and long term, only this effort will create and assure our jobs.

Second, we must through development, structuring and application of new technologies make the work environment more humane to man, protect our natural environment, reduce existing environmental pollution, and--not last--use energy and raw materials efficiently. High-risk developments and constant innovations which open up economically broad fields of application must be stimulated. Here, public support can only give incentives and assistance for self-help. This support is also of significance for future-oriented developments of the chemical industry. Here I refer to direct and indirect support measures, as well as to basic research support in institutions from which new incentives and qualified expert knowledge result.

In the years 1972/1973, for instance, the "DECHEMA Deutsche Gesellschaft fuer chemisches Apparatewesen e. V." [German Society for Chemical Equipment, Registered Association] and additional experts from industry and science worked out a study on biotechnology which can be called a forerunner of the "biotechnology" main support focus. Also, in carrying through area programs and in project control the BMFT obtains insights which are needed for planning. At the so-called statu seminars which are held to evaluate and transmit project results, experts and interested persons who do not participate in the projects also take part.

Insights in the decision process in each case are developed from the varied contacts during planning and carrying out of programs and projects. They form an important basis for responsible research policy.

CHEM IND: Actual areas of research and development activities of the FRG's chemical industry and plant and equipment construction are, among others, biotechnology, coal refining and further development of other processes which contribute to saving raw materials and energy. How does research support by the Federal Government look in the area of biotechnology, and what are future plans? Is there sufficient scope for supporting genetic technology in case of a future additional shortage of public funds?

Von Buelow: Biotechnology is an important key technology for the coming years. It will assist us in mastering the challenges of the next decades in food supply, environmental protection, medicine, and energy and raw materials production. Despite the BMFT's efforts to support basic research and a few biological developments within the scope of project support, the situation is not yet satisfactory in comparison with industrial countries competing with us internationally. We must meet the increased efforts of these countries. The Federal Government therefore grants a high priority to the support of biotechnology.

For 1982 a total of DM 55 million is now available for project support. The increase over 43 million in 1981 is essentially to be used for the further extension of genetic technology at universities and in industry. Inasmuch as this is only a first step in the efforts to catch up with international developments, I shall endeavor to obtain a further increase in funds. Above all, new methods in biotechnology are to be developed and tested in the next 2-3 years. These new technologies must be introduced into industry, agriculture and medicine. I consider it important for the main focuses of research to be worked out in the dialogue with industry and the scientific organizations.

CHEM IND: According to your own statement, headlines about sinking oil prices cannot be the yardstick of a responsible energy policy. What priority do you grant to further research support of coal refining? What possibilities do you see for preserving the research and development work done to date in the areas of coal hydrogenation and coal gasification for the future, despite the lack of profitability which results from calculations based on German hard coal?

Von Buelow: The yardstick of a responsible energy policy is the long-term protection of our energy supply. This objective has been followed by the Federal Government for years. With that in view, as stated in the 2d Energy Research Program, we grant increasing significance to coal refining. At a time when the price ratio of coal and oil was still considered less advantageous than today for our domestic coal, the BMFT took up the support of coal hydrogenation technology, fully aware that no miracles were to be expected in the short term with regard to competitiveness of this technology. Several processes for gasification and liquefaction of coal have been further developed during the last 8 years and tested on a pilot scale. The next steps also include the question of commercial-size prototype plants. In the case of brown coal plants for the production of synthesis gas, the profitability limit has already been reached. Gas production from hard coal will be economically viable only with public support for the enterprises. For the coming years the Federal Government has made available about DM 1 billion in this sector. The technological breakthrough to commercial size is thus prepared for coal gasification.

The results of preliminary project studies on the large-scale technology of coal liquefaction clearly show that profitability cannot be reached here in the foreseeable future. On the other hand, this technology is of great industrial political significance for the FRG. In the future a large market may be expected to exist for such plants in countries with cheap coal, and thus an important export area can be opened up for the German economy. Still this year, the Federal Cabinet will consult on how the coal refining program should be continued; coal refining holds a high rank in the new energy research program and in the planning of financial support funds.

CHEM IND: What are the main focuses established by your ministry with regard to support of additional processes for saving raw materials and energy?

Von Buelow: The future support of research and development work in the industrial area will continue to follow the objectives of reducing energy consumption, increasing the efficiency of energy used, and using waste heat. Included in this are such interesting research and development main focuses as reduction of energy consumption by energy-intensive plants and energy-intensive processes, new energy-saving production processes, and new processes and plants for using industrial waste heat sources, which are of interest to a large number of industry branches and also the chemical industry. Plants for electric current production from waste heat by using low boiling hydrocarbons as the working medium are also significant. Here the chemical industry can contribute a great deal to research and development.

CHEM IND: Particularly in equipment construction, we have intermediate size enterprises whose research should be supported in conformance with the market and without large bureaucratic expenditure. The most suitable instrument for this would be indirect research support, which works by means of a special write-off and/or a subsidy to the personnel budget. Do plans exist for extending the very small volume of indirect research support?

Von Buelow: Federal Government support of research and development in small and intermediate size enterprises amounted to more than DM 800 million in 1981. When this amount is broken down according to initial support undertaken, the following picture results:

- Support for technological peak achievements, within the scope of research and development projects, received approximately one third of the funds spent.

- The increase of the research and development potential with the objective of broad effect, especially by subsidies to the research and development personnel budget, constituted about half of the total support.

- The support of research cooperation through assistance to contractual and community research, as well as measures for improving technology transfers, had a share of approximately 20 percent.

This distribution of funds shows clearly that in each case we offer suitable assistance, which can also be used successfully, for the various problems which are to be found in the small and intermediate size enterprises in the research and development area. Experience of the past years shows that we are on the right path with this differentiated support offer made on the basis of the Federal Government's research and technology policy overall concept for small and intermediate size enterprises. The great publicity received by the special program "application of microelectronics," which has been in force since the beginning of 1982 with a simplified application and accounting process, confirms this. The often-held view that research and technology policy puts small and intermediate size enterprises at a disadvantage because of the bureaucratic procedures involved is wrong but unfortunately proves to be a long-lived prejudice. For this reason, the further development of our concept for the future can and will not be oriented on the immediate argument about direct vs. indirect research support, but instead we will together master problems still existing.

CHEM IND: The ACHEMA [Exhibition of Chemical Equipment] is the most important function of chemical process engineering worldwide and is a central market for exchange of know-how. Do plans exist to intensify and extend international science transfer, that is, cooperation with foreign universities and research institutes, know-how exchange and documentation on worldwide scientific research?

Von Buelow: In its program on the support of information and documentation passed in 1974, the Federal Government singled out scientific transfer as an important objective and initiated the required support measures. Exchange of scientists as carried out, for example, by the German Academic Exchange Service or the Alexander von Humboldt Foundation, the numerous partnerships between German and foreign universities and research laboratories, and the exchange of experience with developing countries within the scope of the German Foundation for Development Assistance (DSE) can be cited as examples. The Federal Government participates in international multilateral information and documentation programs such as UNESCO. This also holds true for the EURONET-DIANE project of the European Community. This on-line data grid, accessible to everyone and preponderantly science-oriented, has been extended to Sweden, Austria and Switzerland above and beyond the European Community. Another significant success was the founding of the Chemistry Information Center, in which the industry participates, on 1 January 1982. Its services are also available to foreign departments. For me there is no doubt that the necessary progress in research and technology will be decisively determined by nationally and internationally available knowledge being made available rapidly and converted quickly into practice, into innovations, into new products and processes.

5586
CSO: 3102/346

FRENCH-ITALIAN ATR-42 PROJECT DESCRIBED

Paris AVIATION MAGAZINE INTERNATIONAL in French 15-30 Apr 82 pp 46-48

[Article by Jacques Gambu: "The ATR-42 Under the Microscope"]

> [Text] Commuter aviation, in the broader meaning of this expression is more than ever on the forefront of events. A new generation of twin turboprop aircraft aimed at a potential market of the order of 2,000 units, is in the making. The ATR-42--the result of a promising French-Italian industrial association--is a prominent member of this new generation. We shall take this opportunity to take a closer look at the technical characteristics of this aircraft, as it now stands.

From a basic airframe including the entire wings, the tail-unit, the propulsion system and the landing gear, Aeritalia and Aerospatiale have developed, first, a standard version, then a few additional versions to answer specific requirements. Apart from that, everything depends on the cabin layout.

Commuter Aircraft

In the commuter version which, in the present state of things, we can call the standard version, the passenger cabin is 13.85 m long and 1.91 m high above the central corridor, which is 0.45 m wide and divides the rows of 4 seats into 2 subrows of 2 seats each. The cabin width is 2.26 m at floor level and reaches a maximum of 2.57 m at arm-rest and window level. The windows are 0.35 m high. The cabin volume is 44.80 cubic meters. The pressurization rate is such that sea-level pressure is maintained up to a true altitude of 4,000 m.

On the basic version, in the cabin layout for 42 passengers with a seat pitch of 0.81 m, we find, from the front to the rear, a first 5.80-cubic-meter bay including two luggage or light freight compartments which can be accessed from the outside through a door located on the left (measuring 1.53 x 1.275 m) and, from the inside, by a small door of a width equal to that of the central corridor.

After that, we find two emergency exits (0.91 x 0.51 m) with the first windows, one on each side, then seat-rows and, at the rear and to the right, a clothes compartment and a buffet. The service door (1.52 x 0.61 m) opens on these

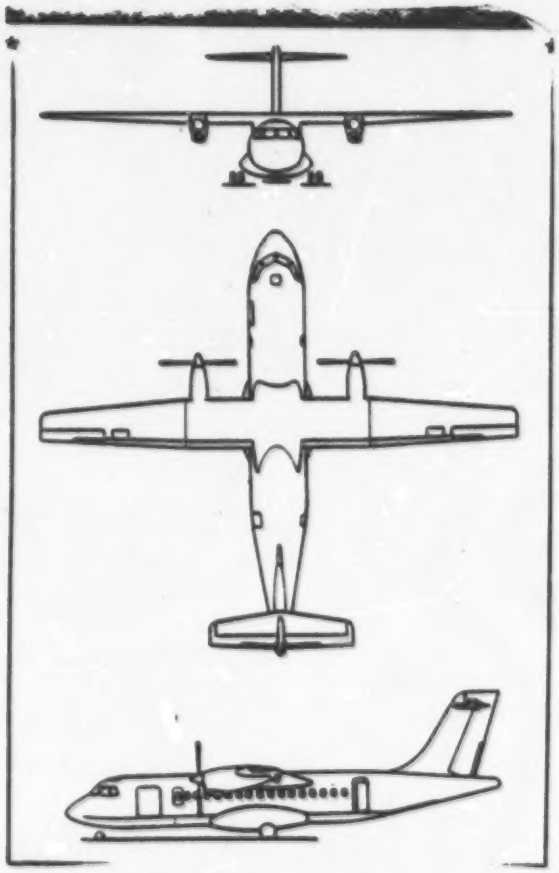

Figure 1. Front, top and side views of the first version.

facilities as well as the rear luggage compartment, which has a capacity of 2.70 cubic meters. On the left side, we find the passenger access door (1.75 x 0.75 m) with its threshold 1.26 m above ground, and a toilet. The hand-luggage racks of the cabin have a capacity of 1.60 cubic meters.

In the 46-passenger version, with a seat pitch of 0.76 m, the volume of the rear facilities has been reduced, whereas in the 49-passenger version, still with a seat pitch of 0.76 m, the volume of the front luggage compartments has been reduced to 3.50 cubic meters, so as to install 3 additional seats. However, the cabin luggage-rack volume has been increased from 1.60 to 1.80

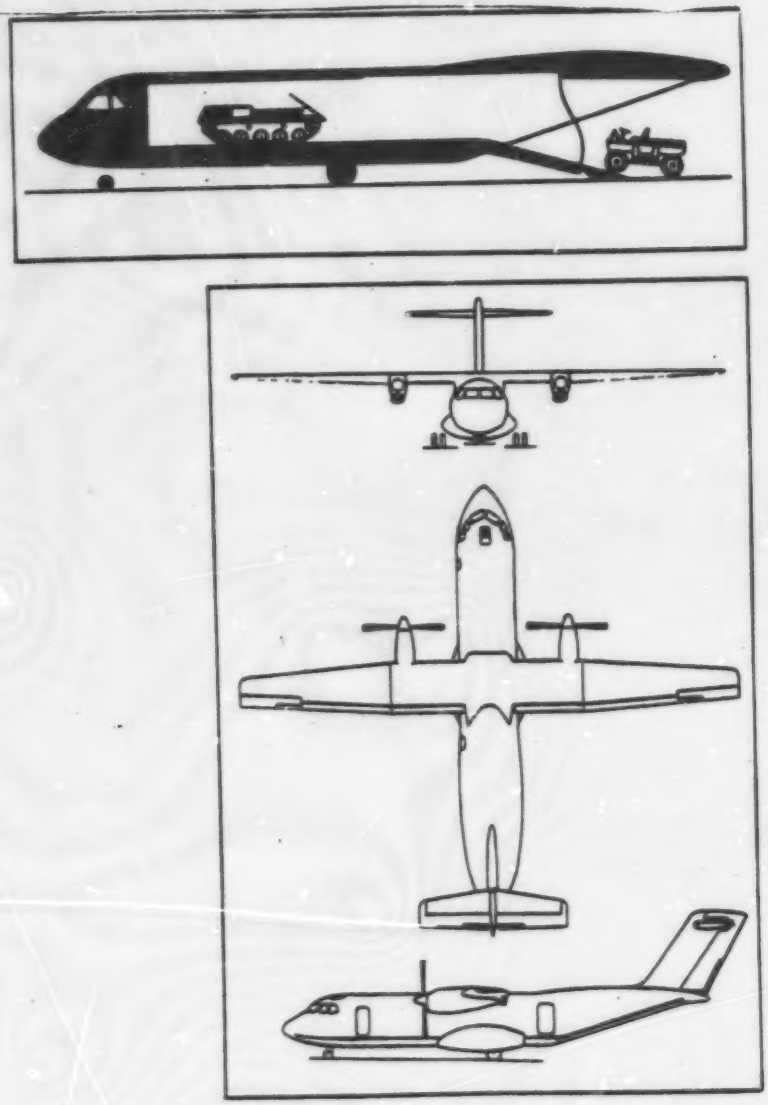

Fig 2

Figure 2. The ATR-42 can easily be converted into a medium-size military cargo plane, simply by modifying the rear section of its fuselage. Top: cross-section of the hold showing the loading system; the loading ramp and the top wall are clearing off the entire hold section. Bottom: front, top and side views of the aircraft.

cubic meters. Finally, the volume available for luggage has been reduced to 8 cubic meters, i.e. 2.60 cubic meters less than in the standard version.

A pure cargo version of the ATR-42, also under study, includes a minimum of modifications. A large rear left door makes it possible to load five LD-3 containers into the cabin transformed into a hold. A front left door allows

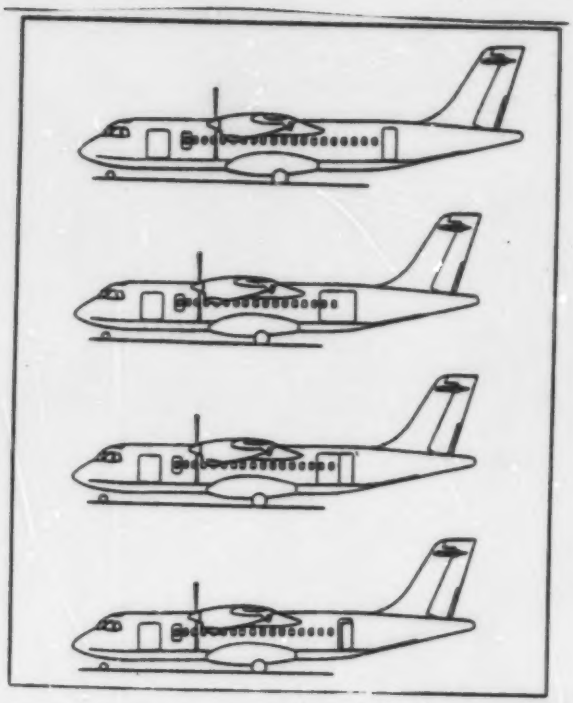

Figure 3. The first offspring of the ATR-42 are shown here. From bottom to top: the standard version; the ATR-42QC "Quick Change" version, available with large cargo doors; the ATR-42F, the pure cargo version; and, finally, the elongated ATR-42XX version of the future. For the military cargo version, see Figure 2 (ATR-42C).

the loading of loose freight, and the rear right service door has been maintained.

The loading and load-handling systems are identical to those of the "quick change" version described below, as are the door and floor dimensions and the hold volume. However, the empty weight is 8,823 kg and the payload 5,282 kg. Of course, the fuel weight and the maximum takeoff weight are identical to those of the standard version.

The "Quick Change" Version

The ATR-42 QC includes a rear cargo door measuring 2.26 x 1.75 m, opening on a ball platform which can accomodate a row of 5 standard LD-3 containers, 1.625 m high and 1.53 m wide. Another front left door measuring 1.275 m x 1.530 m is available, if need be, for light or loose freight. The rear right service door has been maintained. Anti-crash nets are installed forward to protect the two-pilot crew.

The useful floor length is 12.48 m and the available volume 44.60 cubic meters. Retractable latches are provided at the front and at the rear, and lateral guides and latches (all retractable too) along the floor in order to ensure the safe stowing of all loads. In this version, the cabin height has been reduced to 1.89 m and the ceiling luggage-racks are folded against the cabin side.

In this cargo configuration, the empty weight is 9,137 kg for a maximum takeoff weight of 15,240 kg, a maximum permissible landing weight of 14,935 kg, and a payload of 5,785 kg. The payload is reduced to 4,810 kg in the 42-passenger version with a 5.80-cubic-meter front luggage compartment, a 2.70-cubic-meter rear luggage compartment, and 1.60 cubic meter of cabin luggage racks. This general configuration, therefore, is still identical to the standard 42-passenger version.

The FAR [Federal Aviation Regulation] 25 runway length on takeoff is 1,020 m at sea lever under ISA [International Standard Atmosphere] conditions, and 1,165 m at ISA + 20°C. At an altitude of 910 m and ISA + 10°C, the runway length is 1,225 m. At landing, at 0 m and ISA, the required runway length is 920 m.

The Military Version

With the same span (24,572 m) since the wings are the same, this version has a length of 23.20 m and a height of 7.60 m.

However, the entire rear fuselage has been redesigned and the landing gear is provided with 3 low-pressure tire wheels (4.2 bars) which make it possible to use the aircraft from unprepared ground.

This version can be used to parachute 30-36 men--depending on how much equipment and weapons they carry--through 2 opposite side-doors (1.80 m high and 0.90 m wide) which have the peculiarity of opening toward the inside. The men could also be parachuted through the rear ramp which can be opened during flight.

The total volume, including the rear 7-cubic-meter section, is 47 cubic meters. Not taking into account the section corresponding to the rear ramp, the hold is 10.12 m long, 1.89 m high, with a maximum width of 2.26 m. The total floor area is 22.60 square meters.

The empty weight is 9,640 kg for a maximum payload of 4,500 kg. The maximum takeoff weight is 15,740 kg, and the maximum permissible landing weight is 15,430 kg.

As for what the aircraft can carry, apart from the paratroopers mentioned above, the examples are many; judge for yourself: (In the examples mentioned, the load density is 160 kg per cubic meter.)

- 5 LD-3 containers, i.e. 3,795 kg, on four 370-km flight legs without refueling;

- 2 LD-6 and 1 LD-3 containers, i.e. 4,195 kg, and still four 370-km flight legs without refueling;

- 2 LD-11 and 1 LD-6 containers, i.e. 4,500 kg (the maximum load), with three 370-km flight legs without refueling;

- 3 P-2 pallets and 1 LD-3 container, or 3 P-1 pallets, or 2 P-1 pallets and 1 LD-6 container; all 3 examples correspond to the maximum load and, therefore, to three 370-km flight legs without refueling;

- Dropping of equipment such as light vehicles, jeeps, ammunition, etc. It is possible to drop a 1,500-kg load in one piece. The total droppable load is 4,000 kg.

- Medical transport or evacuation of 18 wounded on stretchers with 2 seated medical assistant.

At the weights indicated above, the main performances are as follows: cruising speed at 6,100 m: 500 km/h; operational ceiling: 7,620 m; single-engine ceiling, at ISA + 10°C: 3,780 m; FAR 25 runway length on takeoff at 0 m and ISA: 1,150 m; at ISA + 20°C: 1,345 m; runway length on landing: 895 m. Takeoff distances under tactical conditions, with both engines, at sea level, are 580 m at ISA, and 690 m at ISA + 20°C. As for landing, still at ISA and 0 m, it requires only 505 m.

The range, with no wind, at ISA, with 5 percent fuel reserves and 30-minute wait at 450 m, is 1,500 km with the maximum load, 2,000 km with a 4-ton load, and 4,150 km with a 2-ton load.

The Engines

In a first example, the propulsion of the aircraft is ensured by two PW-120 engines now under development by Pratt and Whitney of Canada. This type of turboprop includes two centrifugal (low-pressure and high-pressure) compressors, each driven by a single turbine. Then, we find 2 free turbine stages driving the 3.96-m-diameter propeller through a reduction gear. The ground clearance of the propellers is 1.23 m. The derated shaft power is 1,800 hp and specific takeoff consumption 245 g/hp/h.

This type of engine, of course, is not the only one that can be adapted on the airframe. In the present state of things, the PW-120, the figures published for which are applicable to all versions, seems to be ahead, but political and foreign trade considerations might lead to the use of other engines--although there are not many in this power range--without considerable changes in the aircraft capabilities.

A Few Figures (ATR-42 Standard Version)

- Characteristics. Span: 24.752 m. Length: 22.80 m. Fuselage length: 21.11 m. Height: 7.58 m. Wing surface: 54.50 square meters. Empty weight: 9,296 kg. Zero fuel weight: 14,015 kg. Payload: 4,809 kg. Maximum fuel weight: 4,500 kg. Maximum takeoff weight: 14,715 kg. Maximum permissible landing weight: 14,420 kg. Wing load: 270 kg per square meter.

- Power. Two PW-120 engines from Pratt and Whitney of Canada, of 1,800 hp on the shaft.

- Performances. Cruising speed at 97 percent of maximum weight: 512 km/h at 6,100 m, and 507 km/h at 4,750 m (ISA). Cruising ceiling: 7,620 m. Single-engine ceiling: 4,725 m (ISA); 4,085 m (ISA + 10°C). FAR 25 runway length at takeoff: 950 m at 910 m at ISA + 15°C and for a weight of 13,000 kg, or at 0 m, at ISA + 15°C and for a weight of 14,000 kg, or at 0 m, at ISA and for a maximum load of 14,715 kg. Permissible runway length for a weight of 14,420 kg: 900 m at sea level, 1,000 m at 1,525 m, and 1,140 m at 3,050 m. Flight range with 45 min waiting time and 160-km diversion, with full load and at best range cruising speed: 4,800 km. Range with the same reserves, at normal cruising speed, with 42 passengers: 1,300 km; with 29 passengers: 2,600 km, or eight 185-km flight legs. Range with the same reserves, at normal cruising speed and with a 1-ton load: 4,300 km.

The overall fuel consumption is established at 278 kg for a 185-km flight leg, and 451 kg for a 370-km flight leg, i.e. a ratio of 1 to 1.31 with respect to the DHC-8 "Dash" 8; of 1 to 1.17 with respect to the SF-340; of 1 to 1.38 with respect to the F-27-500; and of 1 to 1.69 with respect to the BAe HS-748, etc.

The program was started in November 1981; European and U.S. certifications are scheduled for 1985, the first deliveries for the second half of 1985, and the 50th unit for 1987.

9294
CSO: 3102/381

FRENCH AVIONICS INDUSTRY UNABLE TO EQUIP ATR-42

Paris ELECTRONIQUE ACTUALITES in French 18 Jun 82 p 8

[Article by G. Bidal: "ATR 42: American On-Board Equipment?"]

> [Text] There is every chance that, as far as equipment is concerned, the commuter plane now being developed by Aerospatiale and Aeritalia will primarily benefit U.S. manufacturers, especially Collins. This paradoxical situation illustrates the vulnerability of our equipment manufacturers on the civilian aviation market, in spite of the success of Airbus.

For all French aircraft equipment manufacturers, the ATR-42, to be built jointly by Aerospatiale and Aeritalia, appeared to be an excellent program--and the only such civilian program--to ensure the relay between the present Airbus A-300 and A-310 and future developments in this family (A-320 or TA-XX), at any rate a good way of following up on the civilian breakthrough which actually started with the European aircraft. All the more so as the French-Italian aircraft, still unflown, is experiencing an encouraging start, especially with the orders from two U.S. companies.

However, although the future of the ATR-42 is still extremely encouraging, the hopes of our equipment manufacturers are in danger of being crushed by the selection of U.S. equipment, especially from Collins, for this aircraft.

What are the reasons for this possible setback? First, the market for which the ATR-42 was designed is very varied and scattered; therefore, Aerospatiale designed avionics that are simple and standard enough to be adapted to very traditional configurations as well as to a highly sophisticated flight compartment with automatic pilot, microwave landing system, CRT screen display, etc.

With such very general specifications, which are also derived from the concepts implemented on Airbus, it was no longer necessary for the manufacturers to set up a team to study the basic integration of the equipment. In view of the maintenance factor, this solution amounted to favor the choice, by the client, of a complete package which can be offered only by U.S. equipment manufacturers, in particular by Collins.

One way remained open to the French equipment manufacturers: to unite and offer an identical package. Various attempts were made following the initiative of one manufacturer or another. SFENA [French Air-Navigation Equipment Company] offered to organize a group which included most French manufacturers who had worked on Airbus; it was prompted to do so by the interest shown by Aerospatiale for a top-of-the-line version with an automatic pilot and head-up display of the WGD [expansion unknown] type.

But it appears that differences on concepts as well as on the distribution of responsibilities aborted the attempt.

The latest such group is headed by Thomson-CSF and centers around a CRT screen display, the participants being roughly the same.

The Line Effect

However, time is also working against this French and European solution which requires the overall study of a modular system which not only Collins, but also Sperry and, at the bottom-of-the-line, Kollmann, are offering, so to speak, from the catalogue; and the aircraft is due for delivery in exactly two years...

In addition, every marketing consideration is in favor of Aerospatiale's offering a U.S. package; first, because, to a large extent, the ATR-42 market is in North America (almost 40 percent out of an hypothetical 1,000 aircraft). Second, because its Italian partner may not have the same "nationalistic" reasons to support Italian equipment manufacturers who are not in a position to compete with their French counterparts.

Therefore, it appears that, at least for the first units, a largely French and European solution could result only from a political rather than commercial decision aimed at supporting an industry. Such a decision is unlikely, as is shown by the example of helicopters or aircraft such as Dassault's Falcons; a massive americanization of the equipment is in most cases the price to be paid for exporting and, understandably, in view of the tough competition on this market, SNIAS [National Industrial Aerospace Company (Aerospatiale)] and its Italian partner are not willing to take any risks.

Of course, that would still leave some secondary electronic equipment (engine parameters indicators, various gauges); it is also to be expected that French equipment will be offered in option first, before the development of any top-of-the-line package considered by Aerospatiale, but nothing like a goldmine is to be expected.

Some French equipment manufacturers are even blaming Aerospatiale for demanding a "reliability commitment" for the ATR-42, a commitment which they cannot make without giving up their profit margins in view of the dispersion of the market.

A Shaky Industry

However, our purpose is less to relate the ups-and-downs of the ATR-42 program than to illustrate the overall instability of the French equipment manufacturing industry, at least as far as the "civilian cockpit" is concerned. Scattered as it is among isolated slots, this industry has a hard time keeping up with the U.S. giants, their larger series and the conservative habits of a scattered clientele. And the ARINC [Aeronautical Radio Inc.] standards, which increased modularization of the equipment and were therefore expected to give a chance to newcomers, are beginning instead to look like avionics-integrating machines and, therefore, to reinforce the "line effect." Daily examples of this are provided by the commercial aggressiveness of U.S. equipment manufacturers who have become aware of the interest offered by the Airbus program and are even fighting for basic European equipment for the A-300 or the A-310. It is therefore easy to understand why a company like EAS [expansion unknown] has difficulty in maintaining its line of civilian aviation equipment.

Finally, it is to be feared that what is now happening with the ATR-42 will happen again with future Airbus programs, especially with the A-320. It seems that the solution would reside in a conscious effort at cooperating, on the French and/or the European scale, for technical competence is not in question.

9294
CSO: 3102/379

END

JPRS 81632

25 August 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 117

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JPRS 81632

25 August 1982

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SCIENCE AND TECHNOLOGY

No. 117

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BRIEFS

TWO ENZYME GENES CLONED--After 20 months of work, Celltech researchers (Great-Britain) have managed to clone and express the genes of preprochymosine, prochymosine and chymosine in E. coli. Chymosine is an enzyme secreted in the stomach of young ruminants (preprochymosine and prochymosine being its two precursors). This enzyme, which coagulates milk, is used in cheese manufacturing. Celltech believes that the development of highly specialized expression systems is of considerable importance for industrial applications; work is now in progress on the optimization of the chymosine expression rate in recombinants. At present, chymosine producers cannot meet the demand, because of an increase in cheese consumption and a decrease in veal consumption. The world market for chymosine is said to represent from 70 to 200 million dollars per year, according to an estimate by Dow Chemical (United States). (Nucl. Ac. Res., 11 April 1982). [Text] [Puteaux BIOFUTUR in French May 82 p 9] 9294

SCOTTISH BIOTECHNOLOGY CENTER--This project (14 million pounds, up to 22 percent of which are to be financed by the government) was developed by the Scottish Development Agency (SDA), a government-financed agency, in association with the Strathclyde and Glasgow universities. According to Dr D. Mathewson (SDA), the creation of the West of Scotland Science Park (18,000 square meter, located in Glasgow) is intended to improve relations between the industry and the universities, and to lead to the marketing of the discoveries made by Scottish university research: an effective means of providing new impetus for the Scottish industry in the fields of biotechnology and electronics as applied to the medical sciences. The Strathclyde university will provide the required technical and scientific support in the field of microbiology and fermentation. The research conducted at the Glasgow university is centered on the medical and biochemical sciences (virology, cancerology, genetic engineering, cell fusion, etc.); it is financed partly by the Medical Research Council and partly by private industry. This project has aroused the interest of the industry (pharmaceutical industry, veterinarian products, microelectronics, etc.) but no contract has been signed yet. (Information: J.G. Gleave, 120 Bothwell Street, Glasgow G27JP, Scotland). [Text] [Puteaux BIOFUTUR in French Jun 82 p 8] 9294

CSO: 3102/406

MANUFACTURING TECHNOLOGY WILL MAKE SOLAR POWER COMPETITIVE

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 8 Jul 82 p 7

[Text] In Wedel near Hamburg AEG-Telefunken AG has laid the foundation stone for a new solar center. A largely automated manufacturing plant for solar modules and specialized solar laboratories are to be built. Applying great efforts in development, in which the new solar center will also be of future assistance, the company plans to introduce new manufacturing technology after 1985 which will make it possible to produce solar generators at a cost of less than DM 5 (currently DM 25) per watt. The company will then have achieved the first major objective of development which has been under way for more than 10 years, whose aim is the competitive manufacture of solar generating plants in the range up to 1 megawatt, particularly in the Third World.

AEG also wants to use the solar center to train international partners in the area of solar technology. The company is pursuing its goal of cooperating with local partners in those countries that are particularly suitable for the application of solar energy. With Din SA, a national company has already been established in Mexico, in which AEG has a 49-percent interest. The solar center in Wedel will create 150 new jobs; in a second stage of expansion, to be completed by the end of 1985, the same production capacity of several megawatts output per year will be created and the corresponding number of jobs added.

According to its own statements, AEG has acquired an internationally recognized position as the sole European manufacturer in the field of electrical generating systems using solar energy for space travel. By the year 1985, technicians in Wedel in the area of specialization "New Technologies and Space Travel" are supposed to have completed the development of earthbound, decentralized solar plants in the range of up to 1 megawatt. In the business field of "Industrial Plants, Shipbuilding and Special Technology" there are about 100 different areas of employment. Worldwide, about 10,500 workers are employed in the business field, about 4,000 of them work in the Hamburg-Wedel area.

9581
CSO: 3102/392

ENERGY

FRENCH SOLAR POWER PLANT PROJECTS REVIEWED

Paris SCIENCES & AVENIR in French Jun 82 pp 66-72

[Text] Two mirror solar power plants will be put in service in France. One of them, already storm-damaged, had its power reduced by half. The second, which calls on entirely new technologies, is also experiencing a few difficulties. And photocell solar power plants could well be strong competitors.

The first two French solar power plants should enter service this summer: Themis (2 mW) at Targasonne, Pyrenees-Orientales; and the 100 kW plant at Vignola, near Ajaccio in southern Corsica. Thus, following the United States, the International Energy Agency, and the EEC, France will experiment with these thermal stations of a new type, in which the sun's heat substitutes for combustion of oil or coal, or fission of uranium, to activate a turbo-alternator and provide kilowatt-hours to the electricity net.

It has taken more than 6 years to give substance, after sharp technical, economic, and administrative debate, to the hopes of solar energy advocates, among whom were a good number of scientists always anxious to learn the possibilities and limits of a new technology. Yet the end of that long march is reached without the expected enthusiasm: solar power plants, in which some lately saw the dawn of a new energy age, are entering modestly into their industrial phase. To the time of high hopes and militancy for a truly inexhaustible and "self-produced" energy succeeds the more prosaic and reasoned era of technical and economic verdicts reached after a period of full scale tests and experimentation.

Themis has just begun that period under very bad conditions. During a storm in the night of 28-29 November, four of its heliostats were shattered by the wind. Hardly had that first alert passed that a new torment came to break up 10 other heliostats in the night of 18-19 December. Detailed examination following those accidents revealed that in addition to the 14 heliostats broken, some 40 others were distorted, and that the concrete supports for 150 of the 200-odd mirrors were cracked. That serious development incident should not entail too great delay in putting the plant into service,

by mid 1982, but has led to reduction of the plant's capacity to 1 mW through a decrease in heliostat area from the initially planned 50 m2.

Corsica's milder climate spared such damages to the Vignola plant, which moreover has no heliostats. Difficulties were encountered, however, by the Bertin company and SOFRETES, the contractors, in perfecting the second of two 50 kW thermodynamic loops comprising the plant. In addition, the safety equipment, and that for automatic coupling with the net, to be installed by EDF /French Electricity/ will not be available for several months. If the target date of summer 1982 is retained for entry into service, it is possible the plant may operate for a few weeks autonomously rather than as part of the net.

For Themis and the Vignola plant, whose prototype status has always been maintained, such incidents are in the nature of things. Above all, the cost overruns or delays they entail must not prevent attainment of the initial objectives of the French thermodynamic program. What are they?

A Council of Ministers meeting in June 1979 creating the CNESOL /National Solar Power Testing Center/ at Targasonne, and more recently the orientations chosen for the 1982 Solar Energy Commission budget focus effort on research and experimentation not only on Themis and the Vignola plant, but also on Thek captors intended to produce industrial heat of approximately 250 deg. C, which are now being tested on site at Saint-Chamas in the lower Rhone valley. Simultaneously, research is being conducted on medium temperature (250-300 deg. C) materials and components, at a total cost of Fr 15 billion for the thermodynamic sector as a whole.

Beyond the indispensable apprenticeship in operation of the new equipment constituting solar power plants, and correction of possible defects which that might reveal, it is in better control of medium and high temperature materials that the key is to be found for development of an industrial application of solar electricity or heat.

Solar power plants indeed belong to the broad family of thermodynamic machines, and as such are subject to the constraints of Carnot's theorem that theoretical maximum performance equals unity less the ratio of absolute temperatures T1 (of the cold source) and T2 (of the hot source). Thus theoretical maximum performance is closest to unity (at which heat would be totally transformed into work) when the absolute temperature of the hot source is highest. In conventional thermodynamic power stations, the hot source is constituted by a fluid, usually water, which is brought to its operating temperature by an exothermic reaction such as combustion of coal or fuel oil, fission of uranium, or the like. In a solar plant, heat is provided by radiation concentrated on a boiler by focusing mirrors. It is transferred to a thermodynamic fluid (air, water, organic compound, etc.) which activates a motor in turn coupled to an alternator to produce electricity.

Such a basic plan allows for many variations, among which it is difficult to determine, a priori, the best choice, whence the need to experiment with various formulas.

We can first of all distinguish single-collector (boiler) plants from those with distributed collectors. In the latter, each concentrating mirror supplies its own boiler and acts as a single heat-producing module. The Vignola plant is of this latter type, while Themis exemplifies the first.

Another classification criterion, in each of the above categories, is the geometrical nature of the focus of radiation concentration: it can be a point, a straight line, or a complex (caustic) surface. The form of the focal zone bears a direct relation to the geometry of the concentrating mirrors and the procedure for aiming them. Thus a paraboloid revolution mirror (Thek) concentrates solar rays in a quasi-punctual focal zone; a cylindrical-parabolic mirror, on the other hand, presents a linear focal zone, as at the Vignola plant. The nature of the heat-bearing fluid (pressurized water, air, or melted salts), and that of the thermodynamic fluid, finally, constitutes another "degree of liberty" in solar power plant design.

Each family in this repertory has its particular characteristics. Systems with distributed collectors are well adapted to low and medium power production--a few hundred kWe. On the other hand, they have difficulty reaching high power output levels in the multiple megawatt range, for grouping of unitary modules in the heat-bearing fluid network brings technical difficulties (lack of temperature uniformity, loss of charge, etc.), coupled with rapid cost increases. We are then led to adopt a radically different technology in which the heat-bearing fluid net is reduced and collected around a single boiler. Concentration of power required to obtain needed production levels (1 to 10 mWe) then takes place at the level of solar radiation itself, by means of an oriented mirror field.

The French thermodynamic program, from this standpoint, demonstrates good coherence: apart from captors of the Thek type, intended solely for heat production, the Vignola plant appears as the prototype of distributed collector systems, whose power should at all events remain below the megawatt level; while Themis approaches--at the modest scale of 1, then 2.5 mWe--the high power range accessible only to single collector plants. These two installations thus show themselves to be complementary and non-competitive.

For this reason, the experimentation programs to follow entry into service of these first two units will be very different in nature. For a better understanding of their development and objectives, we recall the technical options adopted at each of the two plants.

The Themis plant grew out of theoretical work by a research group created in 1976 from CNRS /National Scientific Research Center/ and EDF, and supported at the technical level by an industrial group, CETHEL, consisting of the firms Heurtey, Fives Cail Babcock, Saint-Gobain, and Seri-Renault. Basing themselves on experience gained from the CNRS solar furnaces at Montlouis and Odeillo, the various partners in that thermodynamic program in 1977 proposed to the public authorities--the DGRST /Delegation for Scientific and Technical Research/ and DEN /Delegation for New Energies/--a first project

baptized THEM (Thermo-Helio-Electric Megawatt). For budgetary reasons this is to be reduced in power and dimension; in its new form and under its new name, Themis, it was adopted by the Council of Ministers on 20 June 1979. Meanwhile, DEN was replaced by COMES [Solar Energy Commission], and this new agency, with 39 percent participation, will finance Themis together with EDF (48 percent), the department of Pyrenees-Orientales, and the region of Roussillon-Languedoc, for a total project cost of Fr 128 billion.

There remains, however, a delicate problem: will Themis, linked to the national electric net, be an ordinary power station, integrated as such with the EDF energy pool, or will it be considered a research prototype and managed by CNRS within a scientific program involved with COMES? A compromise was found: it gives EDF the superintendence of fabric and construction works, whereas the experimental program will be defined and executed under the joint responsibility of COMES, CNRS, and EDF. With settlement of those various preliminaries, construction of Themis began in the last quarter of 1979, and should be completed in the summer of 1982.

The technical principles adopted aim at applying innovation only at the level of solar segments, the other portions being treated according to formulas of proven conventional design. Thus the thermodynamic cycle uses water steam at 430 deg. C at a pressure of 40 bars, and the cold source is an atmospheric exchanger, which will facilitate installation of this type of power station in arid regions. The heat-bearing fluid, which transfers to the thermodynamic fluid the solar heat collected by the boiler, is a eutectic* ternary mixture of nitrates, potassium nitrites, and sodium (NO_3K, 53 percent; NO_2NA, 40 percent; NO_3NA, 7 percent). It offers not only excellent thermic conductivity, but also good physical and chemical stability between 250 and 500 deg. C. In addition it has high calorific capacity, which can be used to advantage for heat storage to offset fluctuations or temporary absence of insolation. The storage system can contain 500 tons of melted salts, which assures operation for some 5 hours at nominal power of 2 MWe. A fuel oil boiler provides for thermic regulation, and, if need be, for night time operation of the plant.

The apparatus for solar heating of the heat-bearing fluid consists of a boiler, lined internally with steel tubes, and placed at the top of an 80 m tower, on which converge solar rays reflected by 200 heliostats, each 53 m^2 in area, totaling 10,600 m^2 of reflecting surface. Each heliostat is aimed automatically by computer so that solar rays are constantly reflected in the direction of the boiler opening.

Entry of Themis into operation will thus, primarily, permit conduct of mechanical and optical tests, and secondly of thermic and thermodynamic tests.

Concerning mechanical tests, damage to heliostats by last winter's storms attest that the survival positioning system (mirrors flat for minimum exposure to wind) is defective, at least at the Targasonne site, despite calculations and individual heliostat testing for planned resistance to winds

over 130 kph. In optical tests, it is important to determine how the 201 heliostats will act collectively during aiming, since good results obtained individually cannot rule out strays, interferences, or parasitic oscillations which inevitably intervene when a large number of electronic circuits is integrated. The margin of tolerance here is very narrow, since aiming precision for a heliostat must remain within a milliradian (comparable to the angle at which a one-franc piece would be seen at a distance of 15 m!). What, finally, will be the fluctuations in quantities of light collected at low and medium solar altitudes--during mornings and afternoons--or after long exposure of the mirrors to dust and inclement weather.

Thermic and thermodynamic tests will permit, among other things, studies of the action of the heat-bearing fluid circuit during the takeoff phase of the plant, bearing in mind that blocks of solidified salts, which may possibly be produced during a locaized cooling phase, are causes of "embolism" in the primary circuit and should be watched very closely.

In the final version of Themis, salt fusion is assisted by a group of 11 Thek captors; this process economizes "noble" forms of energy like electricity and fuel oil, but makes the first stage of Themis somewhat more complex. In like manner, only field tests will allow determination of operating cycles and procedures to be applied at the plant so as to optimize solar energy yield.

These few points illustrate but a few examples of the enormous experimental work now facing the operators of Themis. It will probably have to be extended over several years before obtaining an industrial product exportable for instant use in any sun-warmed area of the world. This period of adjustment should also profit from experience acquired by other solar plants in existence throughout the world (see box) [omitted], and should make it possible to discern the most promising formula from all the possibilities explored.

Without awaiting the results of those tests in use, research laboratories are exploring the next stage. Thus the CNRS solar energy laboratory at Poitiers and Odeillo has begun study of a hot air boiler as part of the Sirocco project, which marks a new step in the progress of solar energy plants.

In Themis, as we have seen, conversion of solar radiation into mechanical work or electricity called for a series of circuits in cascade connection: a heat-bearing fluid, production of superheated water vapor, and then--a steam engine. Use of the latter is possible only up to temperatures of 500 or 600 deg. C, which limits maximum theoretical thermodynamic performance to approximately 65 percent. Moreover, the multiple circuitry reduces reliability of the system as a whole. Hence a radical solution was sought, in which the heat-bearing fluid would double as the thermodynamic fluid, and permit working temperatures of 800 deg. C or above. Project Sirocco provides an answer.

It simply uses air taken from the ambient environment, then compressed and heated to 800 deg. C by a new type of solar boiler and a heat collector at

the exhaust of the gas turbine at the end of the circuit. Heat storage is provided, in one example, by a hot air generator, fed by fuel oil, which substitutes for solar heat if needed.

In this system, the item of first importance is the boiler, whose dual function is to capture solar radiation and heat the air. Since the latter is a bad thermic conductor, exchanges between the gas and the wall are mediocre, and notably inferior to exchanges between melted salt and wall in the case of Themis. Tasks being conducted under project Sirocco concern:

Study of a boiler element allowing air heating to 800 deg C by means of a large exchange surface obtained by creation of "egg carton" alveoles cooled by air jets to the hot points. The material used is a special refractory steel supplied by Creusot-Loire-Imphy. The prototype of such a boiler element was tested from July 1979 to March 1980 at the Odeillo solar furnace, with the aim of optimizing the geometry of alveoles and injectors;

Study and completion of a demonstration thermic circuit, using the Odeillo solar furnace, with 500 kW power. The element not yet available is the air turbine, of 130 kW power. The complete boiler would use seven elements of the type tested from 1979 to 1980.

The Atomic Energy Commission's Saclay center is collaborating in thermic and mechanical studies for the captor. Tests of the complete prototype could begin as early as the summer following availability of all circuit components.

If this formula proves practicable--for there are still many unknowns concerning the materials to be used, such as ceramics and special steels--it can be foreseen that it will give rise to a new family of solar power plants much more compact and better performing than present ones of the tower type. However, the need to produce high temperatures needed for the boiler, and the latter's reduced dimensions, could lead to abandonment of the individual or small group aiming formula for heliostats as presently used with Themis or Eurelios, which can give but a rather large focal spot (50 m2, for example), owing to static dispersion of individual spots.

The process of double reflection used at the Odeillo furnace, with plane heliostats lighting, with beams parallel to its axis a paraboloid of revolution, would offer advantages in terms of concentration, and consequently of temperature, but on the other hand would limit the output of the plant by the dimensions of the parabolic mirror. Large units would then probably have a modular aspect in which the "base" plants would be linked to each other by an electric net.

Modularity is indeed a characteristic of the Vignola plant, with the exception that intermodular linkage is effected by the heat-bearing fluid circuit. The plant in fact has two groups of four cylindrical-parabolic captors, each supplying a 50 kWe turbine, for a total power of 100 kW. In contrast to Themis, the captors are immobile, and aligned in an east-west

direction. The boiler consists of a tube which moves in an axis parallel to the mirror generators, accompanying the movements of the focal axis, which are coordinated with the sun's diurnal movement. Because of a concern for simplicity of fabrication, captors are built, according to a process developed by the AEC, from parabolic profiles made of concrete, which are poured on site, and which support the sections of reflecting mirror installed along the length of the generators. Thus the collectors are not perfect cylindrical-parabolic surfaces, but approximations, by gradations, of that ideal form. The size of the gradations was carefully calculated to avoid excessive distortion of the focal line. The anticipated rate of capture is on the order of 60 percent. Here the heat-bearing fluid is a mineral oil of high thermic capacity capable of withstanding without decomposition an operating temperature set at 250 deg. C. The boilers are supplied with fluid at 180 deg. C, which is heated to 250 deg C by passage through the mirror focus. The circuit also includes a storage tank of 40 m3, permitting operation for 2 hours without sunlight.

Each half of a collector field thus feeds a turbine impelled by a heavy organic fluid, designed by the Bertin firm for this application. Its rate of electric conversion is 20 percent, thanks to its two-stage operation in which the first stage works at supersonic speeds. These high performance levels require high precision design and machining of rotating parts. Cooling is by a water jet.

In contrast to Themis, where as we have said the thermodynamic stage is relatively conventional, the Vignola plant is also innovative in this domain. A large portion of tests will in fact concern new and particularly sophisticated 50 kW turbines. Thermic and manometric reactions of the circuit, especially in transition phases, is likewise a complex area in which experience alone will permit formulation of practical rules of calculation for future installations. Resistance to frost, dust, and possible soil movements such as settling and slides, as well as changes over time in the reflection factor of mirrors, are still major unknowns despite prior laboratory or field tests. At the overall level, operation in tandem of the two semi-stations could bring to light unsuspected difficulties. In that event, the tests due to begin in the summer of 1982 should contribute data elements unobtainable through calculation.

And so, even if the first kilowatt-hour had already been supplied to the net by the Vignola or Themis plant, we see that the road ahead is still long on the way to solar electricity of thermodynamic origin, and to the ultimate objective of robust and reliable installations, reasonable in cost and able to compete, in price per kWh produced, with fuel-fed power stations, or even in the future with photocells. These latter, in fact, have already beaten the thermodynamic sector in the low-power range (less than a few dozen kWh), with a peak investment cost per watt of about Fr 100 to 120.

If the cost reduction now underway should continue, photocell stations could before 1985, and in a good competitive position, approach the 100 kW power range, now exclusively occupied by the thermodynamic sector. Can the latter meet the challenge? This is one of the stakes in the experimental phase of the contest for ground now opening for solar power plants.

CSO: 3102/361

BRIEFS

FRANCE, NORWAY HYDROGEN RESEARCH--At present, the amount of hydrogen consumed in France for essentially chemical uses represents 3 million tons of oil equivalent, i.e. approximately 1.5 percent of our total energy consumption. This gas is expected to play a larger part as a source of energy in the future as it is suitable for many uses and can be stored in large quantities, like natural gas. Studies were undertaken at the time of the first oil shortage in 1973, primarily on how to produce hydrogen economically. Certain research teams hoped to arrive at a process that would make direct use of nuclear heat in chemical reaction cycles ending up with water decomposition. This process, the "thermochemical" process, had to be abandoned because of its low energy yield and high cost. On the contrary, the traditional electrolytical method was actively investigated and, in 1977, a program was set for the French Electric and Gas Company by the Hydrogen Committee created for that purpose. Two working groups were created in cooperation with French industrialists in order to design a 2-MW prototype. The pilot stage would follow, with a higher power capacity. Simultaneously, research is carried out on a more efficient but non-operational process, "advanced alcaline electrolysis"; they deal essentially with new material specifications. It is true that, at this stage, a specialized Norwegian firm of international repute introduced a proposal for and advanced electrolysis prototype facility. This proposal will be examined and compared to that of the French industrialists concerned, whose project is at an advanced stage. Besides, the efforts made on hydrogen are not restricted to its production, and the French Gas Company is now actively working on other problems: pipeline transportation, storage and uses for this product. [Text] [Paris AFP SCIENCES in French 23 Jul 82 p 11] 9294

SPAIN ENCOURAGES WIND ENERGY--The Spanish Ministry of Industry and Energy will soon publish a detailed map of the country's wind energy resources. Based on this map, the authorities will "go into action," according to information disclosed by Mr Celso Penche, head of the Department of New Energies at the Ministry, at a symposium on alternate sources of energy held in Valencia. For the moment, a 100-kW machine is being built at Tarifa, in the province of Cadiz. The Strait of Gibraltar happens to be one of the areas with the most favorable characteristics for this type of energy. There also appear to exist very good possibilities in the north of the country, in Galicia, which would be suitable for the installation of small machines to supply power to isolated homes, and in the Canary Islands, where the prospects for the installation of large machines have led to studies on the possible realization of windmill parks of up to 10 MW power. [Text] [Paris AFP SCIENCES in French 23 Jul 82 pp 10-11] 9294

FRENCH COAL GASIFICATION COMMITTEE--A gasification steering committee has just been set up within the Charbonnages de France group, with the mission of developing and proposing an on-site gasification policy and overseeing its application, as well as study and execution of resulting projects. For each project, the committee will propose the operator, which could be CDF Chimie, CHERCHAR [Charbonnages de France Study and Research Center], or a coal basin, as well as determining allocation of necessary resources. [Text] [Paris SEMAINE DE L'ENERGIE in French 15 Jun 82 p 14]

FRENCH SUBSTITUTE-FUELS COMMISSION--A Technical Commission on Substitute Fuels (CTCS) just established within the Refining-Utilization Programs Committee (COPRU) already in existence, is to initiate a procedure for grants of financial aid to projects put forward in accordance with the substitute fuels development policy. This coordinating commission will include: the French Petroleum Institute, the nationalized Elf-Aquitaine Co., the French Refining Co., Ato Chimie, Chloe Chimie, Rhone-Poulenc, Ugine-Kuhlmann Chemical Products, the nationalized Renault Co., and the Peugeot S. A. group. The Solar Energy Commission will be represented in the new commission by M J. Carre, chief of the Biomass Department. [Text] [Paris SEMAINE DE L'ENERGIE in French 22 Jun 82 p 10]

6145
CSO: 5102/361

ASEA STRATEGY AIMS AT BECOMING ONE OF WORLD'S LEADERS

Paris L'USINE NOUVELLE in French 8 Jul 82 p 29

[Article by Michel Defaux: "Robotics: ASEA's Ambitions"]

> [Text] The Swedish company has great ambitions in the fight about to take place on the robotics market. It aims at conquering one fourth of the world market, by relying on local production and, from now on, orienting itself toward flexible production automation--no longer robots only--and introducing on the market new equipment with further improved performances.

Introducing the company's latest realizations in Vasteras (Sweden), Bjoern Weichbrodt, manager of the industrial robot division of ASEA AB, did not mince his words: "We intend to become one of the world's leaders in robotics. We have the required marketing organization, know how and financial capabilities. This year, we shall produce close to 900 robots and we intend to hold 20-25 percent of the world market by 1985."

ASEA's strategy to achieve this goal is based on increasing its presence around the world; Sweden, of course, will remain the starting point (technical development, production for the European market), but for certain international markets production will take place on the spot. This is already the case for the United States (a plant is scheduled to start operating next September), Spain (especially for tax reasons), and negotiations with Japan are in progress.

Technically, the company's ambitions are no longer restricted to robots; it is now considering the whole field of flexible production automation. For this, ASEA intends to develop the range of applications now covered by its products. This is why it purchased Electrolux in 1981 and, it is rumored, is planning the acquisition of other companies. All this means that ASEA can take care of engineering, supply the robots, of course, and, increasingly, also the peripherals (clamps, tools, accessories).

A Carrier Market: Spot-Welding

This policy has led the company to market packages for applications such as spot-welding, arc-welding, adhesive-bead deposition, and to keep developing new

products. For instance, the IRB-90 robot which has just been introduced in Vasteras. Its capabilities are greater than those of the existing line (90 kg for the 5-axes version, and travelling distances of 2,400 mm along X and Y coordinates), thus making good one of the company's weak points. Initially, this equipment was designed for spot-welding, but it could be used for other applications (handling, deburring). "Spot-welding is a sector with heavy requirements," Bjoern Weichbrodt states. "At least until 1985."

This equipment has already been approved by automobile manufacturers and Saab-Scania has just ordered some 60 for its Trollhaetan plant. The performance of these robots is all the better as they are associated to another novelty, a control cabinet making it possible to reduce programmation time by 25 percent. The user enters the program through a portable console equipped with a syntaxer and the dialogue takes place is uncoded form, in the language of the country. It should be noted that the robot assembly can be moved around a given point (Tool Center Point), a valuable characteristic when it comes to programming the arc-welding torch position. Still using the portable console, the operator can choose a system of coordinates, refine the position of certain points during the execution of the program, and detect failures through a self-diagnostic system.

ASEA has still other projects in its files; assembly lines for instance. "In our opinion, robots should be smaller and faster than those now on the market. This type of application is still in its very first stages. It is one of the prospects we are exploring," Bjoern Weichbrodt adds, mentioning also that seven robots have just been ordered by Saab-Scania (Sodertaelje plant) for the automatic assembly of engines.

9294
CSO: 3102/406

AUTOMATED FLEXIBLE SYSTEMS STAR AT PARIS MACHINE-TOOL SHOW

Paris L'USINE NOUVELLE in French 1 Jul 82 pp 53-54

[Article by Patrick Piernaz: "Machine-Tool Biennial Show: The Appearance of Flexible Cells"]

> [Text] Machine-tools that can feed themselves, change worn-out tools, measure dimensions and adjust displacements... These machines of the new generation have just had star-billing at the Paris Biennial Show.

Production blocks, flexible cells, independent systems... Many different names can describe the ultramodern facilities introduced in June at the last Machine-Tool Biennial Show. Under this diversity, there is a general trend: machine-tools are no longer introduced as individual units. That is too common! The latest is manufacturing systems. Never mind whether they include one or several machines, as long as they can operate automatically without supervision or manual intervention of the operators to load and unload the parts.

"There is a strong demand for this type of systems to machine series of similar parts," Jean-Claude Albrecht, president of Renault-Somua, explains. We heard the same remark at Graffenstaden where, according to Lucien Schaffer, assistant manager, "manufacturers are increasingly looking for machining centers that can work at night without supervision during the third shift."

This trend affects the two main machine-tool categories: lathes and machining centers. In this respect, the machines introduced at the Biennial Show have confirmed the emerging trends noticed at the Hannover World Show. But visitors at the Paris show were surprised by the number and diversity of approaches. As far as machining centers are concerned, TMI [expansion unknown]-Forest and Graffenstaden both offered a machine with a feeding system consisting of a carousel carrying six pallets. This makes it possible to store parts on the pallets in the evening, and the carousel will present them one at a time to the machining spindle until the morning shift takes over. "But to ensure successful operation and make it possible to machine different parts, we have equipped our machines with numerous devices," Gilbert Fischer, Graffenstaden assistant manager, explains: an encoding and reading system on the pallets for part recognition, a numerical control memory that can store up to 15 different program and, above all, many control systems (Renishaw contour feelers, broken-tool detectors, power monitors to report any abnormal operation, etc.).

The same approach has been used at Sagem which has equipped its Precicenter machining center with all these devices, but has chosen an on-line approach for pallet storage. The unit, called Precitransflex, uses a transfer carriage mounted on rails, which picks up the pallets that have been arranged on lined-up contact points distributed at will right and left of the transfer line. The advantages are: modularity (the number of pallets can be increased) and ease of connection to other machines so as to form a flexible workshop.

For turning operations, too, there are many approaches to parts storage and handling. The problem is complex. On machining centers, the time per part can reach one hour (thus providing considerable independence with a small number of parts), but turning times rarely exceed five minutes. Therefore, a choice must be made: either a large storage or the presence of an operator.

Two systems introduced at the Biennial Show provide an interesting answer to this dilemma: those of Ernault-Somua and Sculfort. Ernault-Somua introduced a four-axes lathe, the FLS-40, including two built-in handling arms, one to turn the parts over, the other to load and unload them. It is original in that the parts are fed to the machine by wire-guided carriages. The parts are on pallets--each pallet containing a batch of several tens of parts--and are brought by the carriages within reach of the robot-arm clamps. This approach, which until now had been used only on machining centers (Renault-Boutheon flexible workshop), provides an automatic connection between a machine and a storage area.

Another remarkable system is Sculfort flexible cell which, to begin with, has the advantage of being for real since it is going to be installed in Renault Industrial Vehicles' Saint-Priest workshop. Its application: the machining of four different types of bearing housings with realization times of 2-2.6 minutes. Sculfort has adopted a motorized-conveyor feeding system connected to a CN-25 frontal lathe provided with an automatic feeding device, a manipulator, and a control station for automatic tool-wear adjustment, etc. "This station can test four diameters, monitor the part pick-up distance and make three decisions: to continue the cycle, to adjust the tools for wear, or to stop the machine if a part is out of tolerance," Jean Tauveron, Sculfort general manager, explains.

For all these spectacular realizations, we must not lose sight of simpler equipment which has been introduced and consists of a single lathe equipped with a loading robot that will pick up the parts placed on a carousel. Such independent lathes were introduced by Innovations Mecaniques (T9 lathe + Simrobot), Pittler (Petra), SMT [expansion unknown]-Pullmax (Swedturn 12), Yamazaki (Quickturn), Index (GE 65), etc., not to mention Okuma, which has already sold 3 or its 4-axes LC-20 robotized lathes in France where they will operate 24 hours a day.

For these machines to operate continuously, peripheral equipment will have to be developed to ensure single-pass drilling or milling, automatic dimension control, tool management and automatic tool-replacement. Most manufacturers are now offering these options. Nevertheless, modifications keep being introduced, either in the machine structure, or in guide-way location: the flat/vertical bed is progressively displacing the flat bet so as to make chip removal

easier, but also to provide easier access for the robots. For instance, on the new Cazeneuve HB-CND shifted-bed lathe.

But changes are also made in materials. For instance, thanks to technical assistance from CERMO [Machine-Tool Study and Research Center], concrete is used more frequently instead of cast iron for the machine frame--not only for its stand--because it provides better rigidity and vibration damping. This approach has been adopted on new lathes from Innovations Mecaniques (T10 lathe) and Sculfort (CN-5 lathe) and on a beautiful production machine from Supemec Produmatic, the H-800-CNC, which can operate along five axes (two stations parallel to the spindle and one downfeed station). "The use of concrete guarantees structure stability, a good surface condition, and makes chattering extremely unlikely," Jean-Claude Cottin, Supemec technical manager, explains.

The development of independent machines must be compared to that of production cells consisting of several machines and representing a first step toward a flexible workshop. This approach is necessary whenever a part cannot be completely finished on a single machine. Thus, two lathes or one lathe and one machining station, etc., can be connected. Such cells were introduced, among others, by Manurhin and Halbronn, both using Japanese equipment. To meet this type of requirements, CECN[expansion unknown]-Industrie has developed software that can pilot two NC machines and two handling and conveying systems. "With this software, which works on a small HP-9826 computer, we want to show small and medium-size enterprises that they can acquire a flexible cell with a data-processing budget of less than 200,000 francs," Paul May of CECN Industrie explains.

"However," he goes on, "the creation of such cells from existing machines will require numerical controls that can be connected to a central computer in the direct-numerical control mode, and can take into account dimension control on the machines... Otherwise, the connection will be difficult. This must be considered at the time of purchase of new machines."

The manufacturer of the NUM numerical control studied this problem and, at the Biennial Show, next to its new low-cost 560 computerized numerical control (CNC), it introduced an automatic system for independent machines, the AM 2000, which includes all the functions required for operation without supervision, tool management, program storage, etc. The Italian manufacturer ELSAG [expansion unknown] used the same approach; all its computerized numerical controls are equipped in series with the functions required to create flexible cells: two-way computer connection (RS-132 connection), adaptive control input, possibility of entering parameters from punched tape, and entry of direct feeler-measurement data.

9294
CSO: 3102/405

AUTOMATION TO PLAY LARGE ROLE IN FRENCH INDUSTRIAL STRATEGY

Paris LES ECHOS in French 23 Jul 82 p 2

[Article by J.M.]

[Text] Informatics and robotics are setting a trend. Jean-Pierre Chevenement has just invented a new term: "productics," which is defined as the integrated automation of the manufacturing industries. In its broader sense it means equipment (numerical control, robots, and industrial informatics), software, and engineering (flexible units, artificial intelligence). It is an essential weapon "in our present state of economic war."

All in all, productics is a genuine industry whose market in France already amounts to more than 8 billion francs, and which employs 20,000 people. Its development corresponds to a double economic wager: recovery through renewal of productive investments, and improvement of industrial productivity through automation.

If automated equipment grows at a rate of 25 percent per year--which is the government's goal--productivity should increase from 4 percent to 7 percent per year.

Jean-Pierre Chevenement does not overlook the social problems that could be created by this automation of the manufacturing industries, which employ 3,200,000 people. The workers' concern is legitimate.

However, the minister of research and industry has pointed out that "we don't choose the pace of technologic progress; it is imposed upon us." The wager now is that this progress, when properly mastered, will allow the creation of new jobs: "A rapid and well controlled automation should in the long run not result in fewer jobs." This is true as long as it encourages qualification and social mobility: "Tens of thousands of workers will change their jobs."

French industry is slowly moving into the automation era: nearly two-thirds of the French enterprises have no equipment of this type, and the machine-tool inventory has an average age of 15 years. According to some, this under-equipment represents a handicap of 5-30 percent with respect to our competitors.

In addition to the machine-tool plan, Jean-Pierre Chevenement has therefore just implemented a genuine governmental productics plan.

World production

Country	A	B	C	D	E
Japan (1)	11,000	43,000	780	2,600	3,750
United States (2)	8,130	19,000	980	2,300	3,420
Europe (3)	5,337	17,275	753	2,457	5,319
Scandinavia (4)	560	2,060	190	680	700
France	1,037	3,815	188	304	838
Worldwide	24,507	79,275	2,512	6,357	12,489

A - Annual production (in number of robots)
B - Cumulated production (in number of robots)
C - Annual value (million francs)
D - Cumulated value (million francs)
E - Personnel manufacturing robots
(1) 40 percent of world market
(2) 30 percent of world market
(3) 30 percent of world market
(4) 50 percent of European market

It will notably depend on progress contracts between the government and enterprises, regulating mutual obligations for the rapid modernization of production tooling: investments, training, and working conditions.

Tomorrow, 5000 Robots and a Budget of 2.4 Billion Francs Over Three Years

After the electronics industry, the robotics industry. To guarantee the competitiveness of our manufacturing industries, the government deems it essential to approach robotics as a national industry: equipment, software, services. The goal of the Petiteau task force for 1990 is 5000 "true" robots, with 60 percent French contribution; this does not include "peri-robotics" (automation of production in the broad sense of the word), which represents twice or three times the market.

The stakes are large: increase the productivity of French industry by 20-30 percent during the coming years, and reduce production costs by about 10 billion francs.

Can French robotics meet the challenge? Yes, in research, where "the French scientific potential, notably in matters of language, industrial informatics, and computer-assisted design, is recognized by all, especially abroad."

No, in robot construction, where the largest French enterprise (ACMA, a Renault subsidiary) has a turnover equal to one-tenth (30 million francs) that of the world's largest manufacturer (the American Unimation, with 300 million francs). Moreover, 60 percent of this limited market (the French inventory is estimated at 850 robots) is being nibbled by equipment from Japan and the United States.

A goal of 5000 robots is an ambitious one in this context. An effort will have to be made to achieve it. In manpower: establishment of 410 researchers in three years, creation of 2000 qualified jobs in 10 years. In financial inducements: the total budget to support the robotics plan is assessed at 2.4 billion francs over a three-year period, which should be compared to the 500 million francs of the 1980-1982 period.

The Interministry Committee for Robotics will have to implement these inducements; to possibly find new formulas for financing the demand (the Petiteau report suggest the creation of a compensation chest which will allow the "automator" to benefit from the "automatee's" profits); to structure all the factors in the robotics industry; and to encourage the transfer of knowledge from upstream (research) to downstream (industry).

In the latter domain, the report of the robotics task force announces that the formation of two centers for the transfer of automated production technologies is now under study. The Besancon center would specialize in robotics and peri-robotics engineering, and the Toulouse center would be aimed at the predevelopment of products with a strong informatics orientation.

This "revitalization" of the French manufacturing industries represents an equipment market of 5 billion francs in 1985.

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CSO: 3102/396

AUTOMATION OF MANUFACTURING PROCESSES IN FRANCE

Status Assessed

Paris ZERO UN INFORMATIQUE HEBDO in French 2 Aug 82 pp 4-5

[Article by Jean-Louis Cousin]

[Text] Before even beginning to formulate new measures for robotics and automation, the various teams and services of the Ministry of Research and Industry wanted to obtain as accurate an idea as possible about the present French situation. Their report is categorical: dangerous delays exist both in supply and demand. They create a double threat: undercompetitiveness and growing technical dependence on foreign sources.

One bright spot in the picture however, is the present level of our research. In the opinion of experts, this research "could continue to be competitive if its efforts are bolstered with researchers and budgets".

Still on the subject of research, the Petiteau task force comments that "the French scientific potential, notably in language, industrial software, industrial informatics, and CAD (computer-aided design), is recognized by everyone abroad. Foreign robots (Swedish and Japanese in particular) are equipped with techniques and components developed in France."

France also has a good position in automation service and engineering. The national enterprises achieve nearly three-fourths of France's total turnover in this sub-sector. Notable among these enterprises are Cerci, CGE, CGE-Altshom, Sagem, Seri-Renault, Sodeteg-TAI, and others.

The situation is far from being this good in most of the other sub-sectors.

The ministry indicates that 75 percent of the world CAD market is covered by six American companies. But it believes that several French enterprises also offer very good quality products. Among these are Assigraph, CAO 80, CECN, Dassault Systemes, Graphael, Matra-Datavision, Renault, and Secmai.

The situation is similar in graphic peripherals. In this case, the top specialists are called CSEE, Gixi, Matra-Optique, Sintra-Alcatel, as well as such innovating PMI's (small and medium-sized enterprise) as Celi, Secapa, and some others.

Robotics penetration into various sectors of the manufacturing industries (percent of inventory > 4 percent)

Industries	Number of jobs (percent)	Percent of robot inventory 1980	1990
Food/beverages	3.7	negligible	2-3
Coal, oil, chemistry	2.4	--	
Metallurgy	1.2	--	28
Metal processing	1.2	9	
Mechanical	4.7	8	
Metal processing (semi-finished)	2 to 3	1 to 2	19
Instrumentation	0.7	negligible	
Electrical	2.1	6	
Electronics	1.7	5	
Ship building	0.9	negligible	38
Automobile	2.7	58	
Aerospace	0.8	1	
Cycles and other transportation	0.9	2	
Light hand tools	0.5	< 1	12-13
Textile, leather, clothing	5.2	negligible	
Ceramics, materials	1.4	5	
Wood and furniture	1.3	> 1	
Paper and printing	2.7	negligible	
Rubber, plastics	1.3	4	
Other processing industries	0.5	negligible	

Percentage of jobs in sectors with respect to the active population in industrial sectors. Table based on Diebold information. Source: Ministry of Research and Industry.

American Weight

While the overall weight of the trans-oceanic companies remains significant in informatics production management, it seems to become lighter in some domains. According to experts for instance, French system analysts, engineers, and producers of software such as Cerci, Eca-Automation, GSI, Production Systemes, Sema, Sesa, and Steria, currently satisfy two-thirds of the domestic demand.

In the data-collection equipment sector, Crouzet, CSEE, Sems, TITN, and Trindel supply 50 percent of the national market.

On the other hand, only 20 percent of the French acquisitions of industrial computers are made from our own manufacturers (Sems, CII-HB, Intertechnique).

Proportion of French PMI endowed with automatic handlers

Total:	6% of 1900 enterprises surveyed in January 1981	
By size:	10- 49 employees	4%
	50- 99 employees	8%
	100-199 employees	12%
	200-499 employees	21%
By sector:	Construction materials	9%
	Foundry-metal processing	7%
	Chemistry and associated industries	3%
	Heavy mechanical industry	4%
	Precision mechanical industry	6%
	Electrical construction and associated industries	5%
	Transportation equipment	7%
	Textiles and clothing	7%
	Various industries	6%
	Wood and furniture	9%
	Paper and graphics industries	4%
	Milk and meat industries-Food products fabrication	10%

Source: Ministry of Research and Industry

The installed inventory of automatic flexible shops currently in operation is estimated as follows: 50-100 in Japan, 40-50 in the United States, 70 in FRG, 10 in the eastern countries, and only two in France (some ten projects were counted in our country).

The world supply in this domain comes essentially from American and Japanese enterprises, and the European supply from German or Italian ones. The French enterprises are Automatique industrielle, Cerci, CGA, Sagem, Seri, and Sodeteg.

While awaiting the results of ongoing surveys, the world market is difficult to evaluate. Its growth is said to be greater than 50 percent per year.

Inadequate Supply

For "intelligent" robots of the new generation, which make extensive use of electronics, the French supply remains inadequate despite a good technologic level in research centers (Toulouse, Montpellier, Grenoble, Paris) and several national manufacturers: Acma-Cribie (Renault), Afma-Robotique (Leroy-Somer), Telemecanique, AKR (AOIP), Sormel (Matra), Scemi (BBC group), and so on.

The major foreign leaders are American, Japanese, and to a lesser extent, Swedish, followed by the Germans and Italians.

Dependence on foreign sources remains very high for equipment designed for industrial applications. Better estimates of France's contribution are currently being made.

Finally, the availability of French automation equipment, components, and devices proves to be still scattered; the financial contributions of our enterprises must be increased and their presence abroad developed.

French situation

Sociétés (A)	Type de robot (B)	Production annuelle (C)	Production cumulée (D)	Production cumulée H de G > 150 KFF	Valeur moyenne en KFF (F)	Valeur annuelle en MFF (G)	Valeur cumulée en MFF (H)
Acma-Cribier	Soudure et peinture	60	200	200 (E)	500	30	100
Alma	Pick and Place	100	300	50	125	12,5	37,5
AC3	Télémanipulateur	30	95	100	1 500	45	145
			5		10 000		50
AKR	Peinture	15	17	17	600	9	10,5
AML	Pick and Place	15	27		30	0,45	0,81
Barras	Télémanipulateur	80	150	150	750	45	112
Billaud	Pick and Place	25	50		35	0,875	1,75
Cerci	Assemblage	1	1				
Clinox	Pick and Place	200	800		50	10	30
CSEE	Télémanipulateur	30	48	48	1000	10	24
Lacalhene	Télémanipulateur	45	85	85	150	6,75	12,75
Lenguepln	Soudure à l'arc	12	30	30	400	4,8	12
Scisky	Soudure par point	4	7	7	400	1,6	2,8
Sormel	Pick and Place	300	700		20	6	14
Supemec	Pick and Place	150	1 500		45	6,75	67,5
TOTAL	Soudure, peinture, télémanipulateur, assemblage, Pick and Place	1 037	3 815	687	180	188	620

Key: (A) Companies
(B) Type of robot
(C) Annual production
(D) Cumulated production
(E) Top of the line production > 150 KFF. Price greater than 150 KFF. Japanese classification probably C-D-E.
(F) Average value in KFF
(G) Annual value in MFF
(H) Cumulated value in MFF
Soudure et peinture = welding and painting
Telemanipulateur = remote handler
Peinture = painting
Assemblage = assembly
Soudure a l'arc = arc welding
Soudure par point = spot welding

The major companies in this sector, with more than 1000 employees, are CGA (CGE), Crouzet, Merlin-Gerin (Empain-Schneider), and Telemecanique.

They are followed by about 15 other firms with 200-1000 employees, among which Cerci, SAP, and Sodeteg-TAI (Thomson). But more importantly, there are also some 1200 enterprises with less than 200 employees, a large number of which could be profitable.

Large Growth

The top of the line robot market was assessed by the Ministry of the Industry at 150-200 million francs in 1981. The peri-robotics market is estimated to be two to three times larger.

European situation

Pays (A)	Production annuelle (B)	Production cumulée (C)	Production cumulée H de G > 150 KFF (2) (D)	Valeur moyenne en KFF (E)	Valeur annuelle en MFF (F)	Valeur cumulée en MFF (G)
Scandinavie	560	2 060	1 600	340	190	700
RFA	1 600	4 800	1 200	100	160	480
Italie	1 300	3 900	1 000	150	195	585
G-B	80	300	30	80	6,4	24
Suisse	800	2 400	–	20	16	48
France	1 037	3 815	667	180	186	620
Europe	5 377	17 275	4 517	142	753,4	2 457

Key: (A) Countries
Scandinavia
FRG
Italy
Great Britain
Switzerland
(B) Annual production
(C) Cumulated production
(D) Top of the line production > 150 KFF. Price greater than 150 KFF. Japanese classification probably C-D-E.
(E) Average value in KFF
(F) Annual value in MFF
(G) Cumulated value in MFF

Source: Ministry of Research and Industry

Between 1980 and 1985, experts predict growth rates in these markets of 30 percent per year for Europe and 16 percent for France.

The predictions for the 1985-1990 period are +39 percent per year for Europe and +64 percent for France.

The Petiteau task force thus notes: "The market explosion must result from the entrance into robotics of a new generation of manufacturers with diverse activities, which will compete against the monopoly of the major machine-tool makers. These manufacturers will play a double role, which will first of all lower equipment prices, and secondly, result in a quantitative development of the market by a factor of one to eight, the latter effect to be achieved by a more sector-related and localized service to the user."

Tactics Planned

Paris ZERO UN INFORMATIQUE HEBDO in French 2 Aug 82 p 5

[Article by JLC]

[Text] Support for equipment, regional centers for financing, training, and information, larger research effort, inducements for demand. These are the major orientations of the forthcoming government program of action in robotics and

World situation

Pays (A)	Production annuelle (1) (B)	Production cumulée (1) (C)	Production cumulée H de G > 150KFF (2) (D)	Valeur moyenne en KFF (E)	Valeur annuelle MFF (F)	Valeur cumulée en MFF (G)	Effectif construisant les robots (H)
Japon (40 % du marché mondial) 130 constructeurs	11 000	43 000	4 750	70	780	2 600	3 750
Etats-Unis (30 % du marché mondial) (Unimation 75 % du marché US) (US 30 % du marché européen)	8 130	19 000	3 000	120	980	2 300	3 420
Europe 30 % du marché mondial	5 377	17 275	4 517	142	753	2 457	5 319
Scandinavie 50 % du marché européen	560	2 060	1 600	340	190	680	700
France	1 037	3 815	687	180	188	304	838
Monde	24 507	79 275	13 067	102	2 512	6 357	12 489

Key: (A) Countries
Japan (40% of world market, 130 manufacturers)
United States (30% of world market, Unimation 75% of USA market, USA 30% of European market)
Europe (30% of world market)
Scandinavia (50% of European market)
France
World
(B) Annual production (in number of robots)
(C) Cumulated production (in number of robots)
(D) Top of the line production > 150 KFF. Price greater than 150 KFF. Japanese classification probably C-D-E.
(E) Average value in KFF
(F) Annual value in MFF
(G) Cumulated value in MFF
(H) Personnel building robots

Source: Ministry of Research and Industry

automation. This program will rely very strongly on the work of the Petiteau task force. In what follows, we publish the essential features of the nine proposals made by the task force.

"We are certain that we are in the presence of a new form of thinking and working, which will develop only with the participation of all the social partners, and which will be the achievement of team work," comments Maurice Petiteau in a foreword to the nine proposals advanced by the task force which he headed.

Each word of this sentence has a manifest importance. The task force suggests the installation of a certain number of elements which in its opinion will create an environment suitable for the growth of new concepts, both in terms of ideas and future products.

World market (in million dollars)

Year	World market
1978	45
1979	68
1985	218
1990	700

Source: Ministry of Research and Industry

All these suggestions have attached figures. The whole would require a government contribution of the order of 2.4 billion francs for the next three years.

Productivity Increase

"How often have we seen the launching of such large operations which in fact involve so little financial risk?" asks Maurice Petiteau in his presentation. According to him, their implementation will rapidly result in annual productivity increases of the order of 10 billion francs per year for our manufacturing industries.

Herewith are the nine proposals of the Petiteau task force.

Create an Interministry Committee for Robotics (CIR)--This committee would expand the functions and actions of the Codis-Robotique group. It would coordinate the implementation of the government's policy and of allocated credits in various ministry departments. As already mentioned, it would have a budget of 2400 million francs (1982 value) over a three-year period, distributed as follows: 235 million francs for equipment, 1940 million francs for concerted actions, program contracts, and development aids, and 225 million francs intended for subsidies.

Advanced Regionalization

Specialized Centers--The task force chose to support at present, and as an example, two experimental centers in Besancon and Toulouse, where existing structures provide the necessary potential, distributed among the following organizations: Adepa (National Agency for the Development of Automated Production), engineering schools, technical centers, laboratories, as well as manufacturers and users.

The Besancon center would specialize in light and peri-robotics. It could be established as an Institute for Automated Production, responsible for certifying and qualifying components.

The Toulouse center, named Midi-Robots, would be responsible for predeveloping robotic products with a strong informatics and software orientation.

The means required for these centers are 75 million francs per year.

Major manufacturers

Étranger (A)			
Constructeurs (B)	Année (C) de création	Parc installé (D)	CA MF 81 (E)
Unimation	62	4 000	300
Asea	74	1 500	250
Kawasaki	68	700	200
Trallfa	69	900	150
Cincinatti	75	500	200
Yaskawa-Electric	78	500	180
Star Seiki	72	800	66

Key: (A) Abroad
(B) Manufacturer
(C) Year of creation
(D) Installed inventory
(E) 1981 turnover in million francs

Note: Unimation is 10 times as large as the largest French manufacturer

We might point out that Adepa has planned to open between now and 1985, some ten "heavy" centers (see 01 HEBDO, No 702), endowed with the equipment necessary to raise the awareness of company leaders about automation methods. In addition to Besancon and Toulouse, the opening of such centers is planned for the Paris region, in Nancy, Strasbourg, Aix-Marseille, Tarbes, and Nantes. At the same time, lighter weight installations would be made in all the other regions of France.

Research and Development--The task force plans research efforts on five major topics:

Automation and advanced robotics (ARA), with inroads into artificial intelligence (budget requested: 80 million francs over a three-year period);

Components (150 million over a three-year period), with efforts being directed toward the following areas: sensors, motorization, peripherals, tooling, kinematics, and industrial informatics;

Economic and social sciences: study of the consquences of automation on employment (5 million francs over a three-year period);

Automation of continuous processes (20 million francs);

Liaison with other disciplines (45 million francs), notably informatics, electronics (specific integrated circuits action), mechanics (machine-tool plan), and optics (laser club).

Industrial Development First

The task force believes that the essential development effort must be directed toward industrial development.

Productics in France	French market in 1982 (MFF)	Of which importation (%)
Total machine sector	20,000	55
of which:		
Advanced design machines	5,000	60
Robots	300	50
Industrial informatics	1,200	60
CAD/CAM	300	90
Systems engineering	1,500	80
Total productics	8,300	65

Source: Ministry of Research and Industry

It suggests that a certain number of specific topics in particular should be explored as part of the development aid actions launched by the Ministry of Industry, Anvar (National Agency for the Valorization of Research), ADI (Data Processing Agency), and others.

Among these topics are the impact on quality improvement, implantation into production processes, mobile robots, and so on.

In addition, ad-hoc actions should also be planned. The total budget of this R&D is thus set at 1400 million francs over a three-year period.

Pilot Operations--The task force also proposes the implementation of pilot projects in flexible assembly shops for the manufacturing industries (for instance automotive accessory electric motors, components, electronic cards and circuits, instrumentation, and so on).

The budget forecast for these pilot operations is 258 million francs.

Robotics Training--It was not deemed necessary to create a school specializing in robotics, but it was proposed to use existing resources (robotics option) in present universities, engineering schools, and research laboratories. The budget allocated for this is 30 million francs over a three-year period.

Information and Promotion--Information channels among various private and public organizations will be organized on the basis of existing structures:

Afri (French Association for Industrial Robotics) will receive aid and its activities will be expanded in the dissemination and promotion of information on robotics applications in France;

The learned societies Afcet, ISF, and SEE will increase their activities.

Journal and Expositions

Among the planned actions are the formulation of files (components, research efforts, and so on), the implementation of an observation and forecast system, the creation of a journal, expositions, and so on. The necessary credits will be 20 million francs over a three-year period.

Qualification of Components--In this area, 60 million francs over a three-year period will be necessary to evaluate robot and peripheral components, robotization needs, quality assurance, formulation of standards by Afnor, and so on.

Industrial Structures and Organization--The task force also plans to strengthen the equipment of Adepa regional centers. Other suggestions are: need to foresee specific financing for actions concerning all the factors involved in the robotics industry, creation of societies for service and advice on robotics (SSCR), assistance in creating enterprises with robotics competence, and organization of consulting/distribution networks. The total budget for these actions is assessed at 120 million francs over a three-year period.

Implementation of Procedure for Equipment Financing--"It would be interesting," states the report, "to establish solidarity between automator and automatee," in order to encourage the former toward his best efforts. It is thus suggested that a financing procedure be established, which will extend aid through ADI or as part of the Meca procedure.

According to the robotics task force, government aid for the new "productics" action must be extended to consolidate existing programs.

Codis (Committee for the Development of Strategic Industries) aid: 110 million francs of diverse support for the last two years, given to robot-producing industries and users of flexible shops.

Meca (Advanced Design Machines and Equipment) procedure to aid the promotion of advanced design machines and equipment: 110 million francs of aid will be distributed in 1982 by Adepa.

DAP procedure of public aid for production automation: 20 million francs awarded in 1982 by ADI.

Launching of the ARA program by Cnet (National Center for Telecommunications Studies), involving 300 researchers.

11,023
CSO: 3102/397

FRENCH COMPANY MARKETS ADAPTIVE-CONTROL EDM SYSTEM

Paris L'USINE NOUVELLE in French 3 Jun 82 pp 63-64

[Article by Patrick Piernaz]

[Text] To take 10 percent of the French market for electrical discharge machines (EDM) by 1983: that is the goal which the CFMEE [French Electrical Discharge Machines Company] has set for itself. Next week the CFMEE will introduce two advanced technology machines at the Stokvis display area at the machine tool exhibition in Paris. This is both a commercial and technical event. The French market, which is about 250 machines a year, has until now been entirely dominated by foreign companies such as Charmilles, ONA, Agie, Ingersoll, etc. The French companies, such as Ernault-Somua and Languepin, had one after another thrown in the towel.

The CFMEE decided to take part of this market because it does have some technical advantages enabling it to compete, in terms of productivity, with some of its solidly established rivals in this field.

The CFMEE's strong point is its digital system for processing electrical signals by a microprocessor, called the Memopulse. "This is a true adaptive-control system which analyzes in real time the machining parameters and automatically adjusts the series of discharge pulses in order to achieve optimum efficiency," explains Thanh Ngo Ky, the electronics engineer who designed the generator. The advantages to the user are: the total elimination of the risk of electrical arcing--one of the nightmares of people involved in this field, for arcing damages the electrode--an improvement in productivity of about 30 to 40 percent, and the possibility of using a less highly skilled labor force.

Several large companies have already expressed some interest, including Renault, the SNECMA [National Aircraft Engine Study and Manufacturing Company], Legrand, Matra, etc. But the Memopulse, which is available in three versions (75, 100, and 150 amps) on the MA 6 machine, is not the only machine which the CFMEE is going to present at the Paris exhibition. It will also offer a bottom-of-the-line machine, the MA 3, with a choice of three generators (25, 38, or 50 amps). Two versions of the MA 3 have an APS [Automatic Adjustment System], which automatically determines the machining parameters after the operator introduces the nature of the metals in the part, and the electrode, plus the rugosity desired. "We hope to be able to cover 80 percent of the market needs, with competitive prices: under 200,000 francs for the MA 3 and about 400,000 francs for the MA 6 in the 75 amp version," says Claude Jacquelin, the technical director of the CFMEE, who thinks the company will soon begin to reap the fruits of several years of research and development. For he is certain of the technical success of the machine. One model has already been in operation for a year at a company that manufactures molds for plastic parts and containers, the Moules J. firm at Caudan, near Lorient. The company operates at the intensive rate of 16 to 24 hours a day, and there have been no problems with the machine during the year it has been in use.

Personal Investments by the Company's Employees

"Our biggest problem has been moving to the phase of industrial development, which required a major investment," explains Claude Jacquelin. The first machine was built by a mechanical subcontracting company with 50 employees, Mecato Alberici, located at Meaux. The company could not completely finance its industrial development. So in December 1981 the company's employees decided to invest personally in the establishment of a corporation, the CFMEE, with a capital of 1.1 billion francs. The Soginnove, a subsidiary of the Societe Generale, holds a 28 percent share in the company.

The confidence shown by this bank (the Societe Generale) and the solidity of the project recently enabled the firm to receive more aid from the ANVAR [National Agency for the Advancement of Research], the CIDISE [expansion unknown], and a loan from the CEPME [expansion unknown]. "With this aid we were able to start a series of 10 machines, to prepare our facilities, and buy a computer and a device to test electronic circuits and racks," says Claude Jacquelin.

The CFMEE handles the complete manufacturing of the electronic part of the machines, subcontracts the mechanical work, and does the final assembly. To handle sales, the CFMEE has signed a distribution contract with Stokvis, which will contribute its knowledge of the electrical discharge machining market and a sales force with a product manager and 12 sales representatives. The CFMEE also plans to export to Belgium (it has displayed its products in Brussels already) and to Italy, where it will take part in the next exhibition in Milan. After that it will move into Switzerland and Germany and expand its export market there.

7679
CSO: 3102/386

FRENCH MAKERS OFFER SEVERAL PATTERN RECOGNITION SYSTEMS

Paris ELECTRONIQUE INDUSTRIELLE in French 1 Jun 82 pp 33-35

[Article by Gerard Bidal: "Pattern Recognition Systems"]

> [Excerpts] A $30-million market in 1981 (according to an American study) that could increase tenfold in 5 years! These are the market facts with regard to pattern recognition systems. As of now, several companies are already working on "universal" systems of visual inspection by video cameras, designed to be inserted into automated assembly lines or robots.

The recognition of patterns has left the laboratory and has arrived in industry. Although most of the applications have until now been the object of studies and of specific actualizations, it is the "universal" type of visual inspection system, designed to be inserted in automated production lines or in robots that, only recently, has begun to be marketed. At present, the possibilities of this type system are still limited to "bidimensional" applications, such as the inspection, the sorting of parts (generally flat ones), the on-line dimensional checking or the automated semi-random pick-up of components. More complex problems, however, such as the following of spot welds in the process of arc welding, are on the verge of being resolved; also, the capacity of these systems for accepting several video camera inputs offers a way of approaching the problem of tridimensional inspections by increasing the number of different camera viewing angles.

By far the greatest interest in this market is being manifested in the United States, with the creation of many companies, such as Machine Intelligence, Object Recognition Systems, and Solid Photography, all specializing in the industrialization of artificial intelligence, without overlooking companies like General Automation, General Electric and Automatix, whose systems are being marketed in France.

French Firms

Renault has already put into service several load-unload type robots equipped with a tridimensional recognition system using a video camera and ultrasonic

depth-sensing. However, the firm has no immediate plans for marketing separately either its vision system or its recognition algorithms.

Adersa Gerbios markets an image-digitization peripheral, the NIM 628, which differs from previous systems in that it works on the basis of 4-bits-per-pixel coded images. Moreover, it features, besides [gray-scale] thresholding, the full range of manually variable or self-adaptive-programmably-variable coding. This feature helps overcome the problem of relatively dim lighting with all the methods being marketed to date (The lighting throughout must be relatively stable and homogeneous, and the problems of shadows and parasitic lightings are still only poorly resolved).

Built around two Signetics 8 x 300 fast microprocessor cards, the NIM 628 is available in a stand-alone version enabling simple robotics applications (comparisons of contours, relative localization), or as a peripheral connected to minicomputers (Mitra or PDP-11) or to microcomputers of the Apple III type.

Adersa Gerbios also offers basic softwares (outline histograms, multi-window acquisition, high-definition multipass acquisitions to 128 shades of gray, sorting algorithm) and is currently developing applications. The Association is especially busy, under an ADI [Data Processing Agency] contract, on a program for classification and inspection of bovine carcasses, and on the identification of persons by readings taken on the iris of the eye. The NIM 628 is being offered at a price under 25,000 francs in the OEM [expansion unknown] version including the two basic cards, and at around 50,000 francs in the version mounted in a 19-inch rack.

Lastly, it is to be noted that the Bertin company has also developed an object recognition system by video camera, which resembles the American systems but is more oriented toward the sorting of parts.

[Boxed insert]:

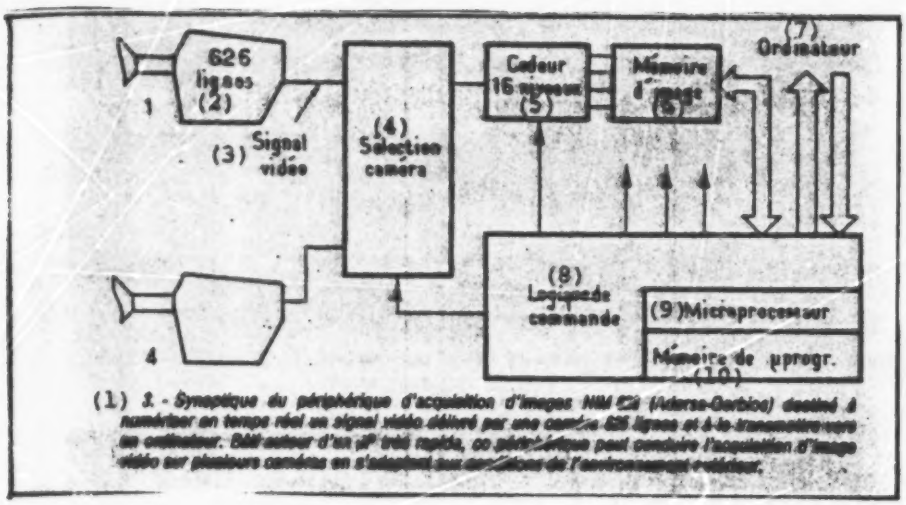
With Pattern Recognition, Advent of the Second Generation of Robots

The system developed by Renault can be considered the first industrialization of a robot capable of random pick-up of nonplanar parts in three-dimensional array.

Developed by Renault's DTA [Directorate of High Technologies], these robots, which are capable of reacting according to their environment by way, in particular, of an image analysis performed by video cameras, constitute truly the second generation.

Using a standard video camera, the pattern recognition system analyzes a square image 1 meter on a side in terms of 256 x 256 shades of gray. Then by calculating its barycenter and finally its angle orientation, it recognizes the face on which a nonplanar part is resting. The picking up and then the positioning of the part on a machine become functions of this image. For simplicity, we can say that the technique involved is one of measurement of characteristic sizes followed by comparison of the results with the different shades of gray learned for each size in each possible position.

The pattern recognition system in operation in several Renault plants enables the random pick-up of non-isolated parts by different robots. A case in point is a pick-up robot that feeds a machine tool from a 3-orthogonal-axes stack of parts. The pattern recognition system operates in two stages: First it isolates each part in the stack and correlates the image data by means of an ultrasonic telemeter to determine the height of the top of the sta ; then, the contours of the part having been isolated, its position is determined by the method described above for the recognition of isolated parts.



(1) 1 - Synoptique du périphérique d'acquisition d'images NIM 628 (Adersa-Gerbios) destiné à numériser en temps réel un signal vidéo délivré par une caméra 625 lignes et à le transmettre vers un ordinateur. Bâti autour d'un µP très rapide, ce périphérique peut conduire l'acquisition d'image vidéo sur plusieurs caméras en s'adaptant aux conditions de l'environnement extérieur.

Block diagram of the (Adersa-Gerbios) NIM 628 image acquisition peripheral designed to digitize in real time a video signal delivered by a 625-line camera and transmit it to a computer. Built around a very fast microprocessor, this peripheral can perform the image acquisition function via several cameras, adapting itself automatically to the conditions of the external environment.

Key:

1. [See caption above].
2. 626 [as published] lines.
3. Video signal.
4. Camera selection.
5. 16-level coder.
6. Image storage.
7. Computer.
8. Command software.
9. Microprocessor.
10. Microprogrammer storage.

9399

CSO: 3102/371

RESTRUCTURING OF MACHINE-TOOL INDUSTRY UNDERWAY

Paris ELECTRONIQUE ACTUALITES in French 11 Jun 82 pp 1,5

[Article by G. Bidal]

[Text] At the opening of the 12th Machine-Tool Biennale on Friday 11 June, the industrialists will undoubtedly hang on every word of Mr Dreyfus, Minister of Industry. However, they will have to wait several weeks before they receive the details of the government plan which will lay the foundations of France's automation strategy.

Still, one thing is certain: the two major groups being formed in the French machine-tool industry are controlled by public capital.

Visitors and exhibitors would have strongly wished that the government had selected the occasion of the opening of this 12th Biennale to present the final version of its machine-tool plan. Their impatience is easy to understand: the plan, which is not merely a rescue action since it stipulates more than 4 billion francs of public funds, of which 2.3 billion of direct aid, will radically reshape the appearance of an entire industry, with which we should point out, electronics will necessarily have increasingly closer contact.

Their impatience will be remain mostly unsatisfied because the definitive plan will not be finalized and made public [translator's note: material missing in original].

Heavy Machinery Group

As expected, the first group will be gathered around Line, with Berthiez--subsidiary of SNECMA (National Aircraft Engine Study and Manufacturing Company)--Saint-Etienne Machine-Outils, and TMI-Forest.

This new company would specialize in heavy machinery, milling machines, lathes, and machining centers, and in the production of very large parts for aeronautics, electrical construction, and the automobile industry. It should therefore come as no surprise to find among the nine enterprises which will participate in its capital, the steel producers Sacilor and Usinor, the large aircraft firms Dassault, Aerospatiale, and SNECMA (National Aircraft Engine Study and Manufacturing Company), the auto manufacturers Renault and Peugeot, as well as the large electrical construction firms Alsthom-Atlantique and Empain-Schneider.

[Translator's note: material missing in original] preponderance of a very concentrated market, and of customers demanding a large number of custom products, made it easier to establish the group. We should also note that for this type of machinery the intervention of the electronics industry carries little weight in structural matters; in most cases, machine automation is initiated by the buyer, who generally has the means for studies and development.

Machining Centers Problems

The situtation is entirely different for the second restructuring group, which primarily concerns machining centers: these machines, which are also aimed at an average market, become true basic cells in automated production. On the other hand, it is for these types of less specialized machines, which end up as catalog products, that the competition was keenest among French enterprises.

It is almost a foregone conclusion that this group will gather Hure, Graffenstaden (subsidiary of CIT-Alcatel), and HES (Ernault-Somua of the Empain-Schneider group). And while public funds will also be in the majority here (undoubtedly about 60 percent), other problems remain to be solved: the selection of standard basic components (this is one of the plan's important goals), which could definitely favor one given manufacturer; the fate of agreements that are underway (particularly that of HES and Toyoda, who are jointly building machining centers in France); and the policy toward manufacturers which will not be formally associated with this group (Sagem comes to mind). On the other hand, the new structure will be faced with electronics problems: not only in numerical control--for which no restructuring will be necessary, NUM remaining the only French manufacturer--but also in "communications" electronics, where standards will very soon be indispensible and will not be able to wait for the studies being conducted on the topic by CERMO (Machine Tool Study and Research Center), CETIM (Technical Center of the Mechanical Industries), and ADEPA (Association for the Development of Automated Production).

Finally, we need not mention the difficulties associated with the inevitable personnel cutbacks, cutbacks which actually concern the sector as a whole and not only the machining center group.

Orders From the Ministry of National Education

Yet one of the essential short term points of the machine-tool plan has just had an effective start with the orders for machines that the Ministry of National Education has just given to about ten enterprises, among which Cazeneuve (for 30 million francs), Ramo (10 million francs) and Innovations Mecaniques. The total orders from the ministry will add up to 430 million francs for the year, and 550 million francs per year are planned for the next three years. It is even conceivable that a third group, for smaller size numerical control lathes, could form around the major enterprises that are benefiting from these measures: Cazeneuve, Ramo, and I.M. on one hand, and Dufour and Vernier on the other. And the list is undoubtedly not finished.

11,023
CSO: 3102/377

COLOR SCREENS DISPLAY PLASTICS-PROCESSING FUNCTIONS

Paris L'USINE NOUVELLE in French 1 Jul 82 pp 56-57

[Article by Pierre Laperrousaz: "Plastics Processing on a Color Screen"]

> [Text] Color-screen animated display of injection press operation, rapid change of molds, automatic control of parts, increasingly diversified unloading and insert-placing robots: all these developments introduced at the Europlastic Show will soon change the face of plastics processing.

The control of injection presses has just taken a new step forward. At the last Furoplastic Show, two French companies, DK-CODIM [expansion unknown] and CPI [expansion unknown], introduced control cabinets equipped with color screens to display in graph or table form the adjustment and operating parameters of machines.

Thus, on the CPI-60 screen, displaying an animated graphic representation of the machine, the user can follow the progress of a cycle (weight feeding, injection, opening, ejection). Also, the condition (heated or not) of the various zones of the heating element is indicated by a color (red or blue) on its image. Of course, actual temperatures as well as set values are also displayed. DK-CODIM's Module 6 offers similar services. In both systems, the operator enters the set values through a very simple keyboard and draws the curves (injection pressure, holding pressure) directly on-screen, as bar graphs.

These systems would be mere gimmicks if they were not backed up by sophisticated closed-loop microprocessor controls for the main machine functions (injection, holding, heating, etc.). In addition, both systems are the only two on the market to offer self-adaptive closed-loop controls: a real-time computing loop modifies adjustment parameters during injection, as a function of the viscosity variations and thermodynamic characteristics (pressure, density, pressure-volume-temperature curve, etc.) of the material.

At a time when electronic computer games are invading our daily life, such a trend should not require too great an effort of adaptation on the workers' part. Nevertheless, some manufacturers are expressing skepticism at what they believe is technological escalation. "Does this really meet the processor's requirements,"

Philippe Pertuis (SMTP-Billion) asks, and he adds: "After all, we have sold 150 Visumat, whereas that new system has been on the market less than 2 years." For its part, DK-CODIM has received an order for nine Module 6, and CPI has sold an LPI-60 to a processor, to be mounted on... a two-material Billion press. Like SMTP-Billion, most other manufacturers are now offering screen displays, but in the now traditional form of "pages" (closing, heating, injection, etc.), where all the data are "written" in uncoded form. In particular, Battenfeld is offering its new CNC-80/85, a numerical control where almost all parameters are regulated in a closed loop.

Automatic Fluid Connection

Today, most manufacturers are offering centralized control systems for groups of machines. Some of these systems are no longer merely collecting data: they also take over production management tasks. This is the case with Ordimat (SMTP-Billion) which operates on a Digital Equipment PDP-11-34 minicomputer. The software developed by the Oyonnax company enables the user to check many functions instantaneously on his screen: review of the workshop technical facilities, schedule, order file, workload planning, production follow-up, statistics and adjustment programs.

Secondary injection functions are also getting automated. At Demag, the deviation between the actual injection pressure profile and the set profile is used as a criterion to distinguish good parts from the rejects, which are automatically removed after ejection. An increasing number of manufacturers are offering automatic mold-changing systems (Battenfeld, SMTP-Billion, Demag, etc.). The first two use molds, the two halves of which are attached to preparation platens which also carry quick-connecting elements for the fluids (water, oil, electricity). As a result, even old molds can be used with this system.

Fluid connections, which are the most time-consuming manual operations, are made automatically. In Battenfeld's Mouldfix, the mold is assembled in two steps: it is first attached to the nozzle platen by means of hydraulic clamps, then to the mobile platen, after the press is closed. The connections, too, are made in two steps. In Billion's system, the mold is lowered from the top and is hanging from the upper tie-bars of the press. When the press is closed, the connections are made simultaneously for both mold halves, and the (central) ejector pin is hitched up. Since Billion presses are equipped with an automatic thickness adjustment device, this operation does not cause any problems: it takes less than two minutes to change a mold!

"Programmable" Manipulators: More Extensive Capabilities

Manipulators and loading/unloading robots are about to become indispensable features in the processing workshop. The last Europlastic Show only confirmed this trend with an extremely varied range of equipment, from the simple sprue-removal device to the palletizing robot. Among the less sophisticated systems, a newcomer, Chaveriat of Lavans-les-Saint-Claude, introduced a three-axes robot (with a wrist rotation) for 100-500 ton presses. This device, the motions of which are regulated by limit switches, is purposely intended for simple part-unloading equipment. More complex, "programmable" manipulators also offer more

extensive capabilities: quick change of production line through the selection of a program stored in memory beforehand, variety of motions thanks to the numerical control of one or several of the axes. For instance, on SEPRO's [expansion unknown] PIP robot, the lateral displacement is digitized, thus making intermediate stops possible to execute secondary tasks (sprue-removal for instance). The programs are entered by the user through a keyboard (up to 15 can be stored in memory). SEPRO is studying a robot with a digitized vertical axis for palletization.

Other foreign manufacturers (Kueffner, Remak, Colortronic) are also offering manipulators with one or several digitized axes. "The market is in full expansion," according to Bernard Elineau (SEPRO). "We shall probably sell 50 units in 1982, and 1000 within the next five years."

Applications for insert-placing are less common than for mold unloading. We must say that the precision of pneumatic motions is inadequate. This is why the Mercure 82 robot of Roboplast (Amiens)--which uses an electric screw for its lateral motion--uses linear amplifiers deriving their power from the machine hydraulic system for the other two motions (vertical and horizontal). These amplifiers, manufactured by SIG [expansion unknown], a Swiss company, include a stepping motor piloting a servovalve which, in turn, supplies power to a hydraulic jack with mechanical counter-reaction. This integrated device provides great ease of control (thanks to the stepping motor) and a high precision, with respect to both speed and position. "We can reach 5/100 of a millimeter," they say at Roboplast, "which makes it possible to place inserts. In particular, we are thinking about fusible inserts, which would simplify the tools." The Mercure 82 robot, which received a prize from ANVAR [National Agency for the Valorization of Research], is considered for use on 200-ton presses.

9294
CSO: 3102/410

BRIEFS

MACHINE-TOOL DEVELOPMENT CONTRACTS--In his opening remarks for the Machine-Tool Biennale on 11 June, Mr Dreyfus, the Minister of Industry, confirmed that all the provisions of the machine-tool plan will be applied. He stated that 20 enterprises are currently negotiating with the government for development contracts, a number of which should be closed "within two to three weeks." Among the enterprises involved, the minister named Num (whose name is mentioned for the first time in the machine-tool plan), Rouchaud, Vernier-Dufour, Clement, and Amstutz-Levin-Gabin. Mr Dreyfus also confirmed the practically completed creation of a "heavy machinery" group, gathering together the activities of Berthiez, TMI, Line SA, and Saint-Etienne Machine-Outil. Regarding the action of the government in robotics, the minister mentioned the development contracts issued by Codis (Committee for the Development of Strategic Industries) to CEM, Prodel, Trefileries and Atelier de Commercy, Afma-Robots, CFC (Compagnie Francaise des Convoyeurs), and Automatique Industrielle. As for Codis' flexible shop pilot projects, Mr Dreyfus disclosed that about ten new projects were being prepared and documented, not including the projects currently being implemented (PSA-Citroen at Meudon, SNIAS-Sagem at Chateauroux, Messier-Hispano at Molsheim, and Poclain at Saint-Etienne). [Text] [Paris ELECTRONIQUE ACTUALITES in French 11 Jun 82 p 5] 11,023

AERONAUTICAL COMPOSITE-MATERIALS COMPANY--Aerospatiale, Avions Marcel Dassault-Breguet Aviation and SNECMA [National Aircraft Engine Study and Manufacturing Co.] have just signed a draft agreement for the creation in Corsica of an aeronautical composite-materials company (see LES ECHOS 21 Jul 82). Although the future company, Corse Composites Aeronautiques, has not yet been incorporated, the project is progressing rapidly. This new enterprise could create some 100 jobs, most of which would go to islanders; it would be located on a 3,000 sqare meter plot in the Ajaccio industrial park. It will use advanced technologies to manufacture composite-materials parts for aircraft, helicopter, missile and reactor structures. A large initial investment, close to 25 million francs, will be required. National development and regional employment subsidies could be granted, at a rate not yet disclosed. At the regional prefecture in Ajaccio, it is rumored that the file is handled in Paris exclusively, because of the size of the investments involved, and that the final decision will come from "higher up." At the Ajaccio Chamber of Commerce, the opinion is that the decision on public subsidies for Corse Composites Aeronautiques will be made by the future president of the Corsican Assembly, to be elected next August according to the proportional representation system, under the special status bill. [Text] [Paris LES ECHOS in French 22 Jul 82 p 10] 9294

SCIENCE POLICY

FRG'S RESEARCH BUDGET FOR 1983 OUTLINED

Frankfurt/Main FRANKFURTER ALLGEMEINE in German 21 Jul 82 p 26

[Text] The budget outline for 1983, recently passed by the cabinet, provides for an increase of 7.3 percent from about DM 6.6 billion to DM 7.1 billion for the Ministry for Research and Technology (BMFT). (The entire Federal budget increased by only 1.9 percent to DM 250.5 billion.) The high rate of increase is partly based on the fact that DM 120 million had to be absorbed additionally into the budget for the two advanced reactors lines, the fast breeder and the high-temperature reactors, because of cost increases, and more than DM 60 million have been set aside for the Gorleben final storage project. The largest entry in the budget is energy research, with DM 2.7 billion, followed by space research and technology (DM 920 million) and basic research in physics and chemistry (DM 624 million). In addition, DM 576 million have been allocated for general support of science and DM 499 million for "Technology for Health, Nutrition and the Environment."

According to medium-term financial planning, the budget was to be DM 200 million larger in the coming year. The cuts principally affect large-scale technical expansion of coal technology, for which only DM 164 million are included, instead of DM 211 million, as intended earlier. Development work on coal conversion will not be abandoned. The BMFT wants to maintain the continuity of its support of basic research, but some major projects, such as the Hera storage ring for Desy in Hamburg and the spallation neutron source, will have to be postponed temporarily. Only construction of the X-ray satellite, Rosat, which has been ready for a long time, can begin in the coming year.

The clear areas of emphasis (as a percentual increase, even if not in the absolute amount) turn out to be support for innovation and support of the establishment of new technology oriented companies (up 35.7 percent to DM 38.6 million) and electronics with the boosted special program "Applications in Microelectronics" (up 27 percent to almost DM 30 million). The decline in expenditures in oceanic research (down 13.4 percent to DM 185 million) has various factors as its cause, the completion of the polar ship and the postponement until 1984 of the start of construction of the new "Meteor." Funds for "Information and Documentation" (down 10.7 percent to DM 73 million) can be reduced, because the specialized information centers, expanded in recent years, are gradually transferring to other sources.

9581
CSO: 3102/392

SNECMA WITHOUT PARTNER AS ROLLS-ROYCE, PW PLAN CONSORTIUM

Paris L'USINE NOUVELLE in French 3 Jun 82 pp 62-63

[Text] The first U.S.-British steps have been taken toward the development of a jet engine for a future 150-seat plane. Pratt and Whitney, the American firm, and Rolls-Royce, its British counterpart, have just announced that they are planning to form an international consortium by summer to develop a jet engine for 150-seat planes.

For 2 years the British company has been working in cooperation with three Japanese firms (Ishikawajima Harima, Kawasaki, and Mitsubishi) on a similar project, the RJ 500, which has allegedly cost 220 million francs in investments to date. The U.S. company, Pratt and Whitney, with its PW 2037 project, an engine of the same class, has been working with MTU in Germany and Fiat Aviation in Italy. In the first phase, this is the group of industries that would form the nucleus of the international consortium just announced. But the group would not stop there: the Swedish firm, Volvo Flygmotor, is reported to be interested in the project.

What class of engine will be developed? Will Rolls-Royce be willing to abandon its RJ 500 project: Or will Pratt and Whitney agree to drop its program? There are a great many unknowns, which the SNECMA [National Aircraft Engine Study and Manufacturing Company] is interpreting as insurmountable obstacles.

This is a very understandable reaction, as at the end of last year, Rolls-Royce had told Charles Fiterman, France's minister of transport, that it was interested in a tripartite cooperation with the SNECMA and the U.S. firm, General Electric. So there is great disappointment in French industry. And it is hard to see how in the future SNECMA can engage in such a program alone,

after the U.S.-British partnership, even if General Electric does agree to provide technical assistance, if not financial aid for the project.

The matter is one of considerable importance. Developing a new aircraft engine carries a price tag estimated now at $1.5 billion. This means that few companies in the world can even attempt to take part in such a program. After the Pratt and Whitney-Rolls-Royce agreement, is there still room for another consortium? SNECMA has not answered that question.

These maneuverings seem to have left the Airbus Industrie group undisturbed. It has stated that its program for the small Airbus A 320 of 150 seats, whose market is estimated at 1,000 planes, "is continuing normally." There was great appreciation in Paris for the recent statement by Chancellor Schmidt at the Hanover Salon, when he spoke of his support for the A 320 program, "assuming that firm orders do materialize."

7679
CSO: 3102/386

DE HAVILLAND OF CANADA TO PARTICIPATE IN A-320 PROJECT

Paris LE FIGARO in French 27 Jul 82 p 7

[Article by "P.B."]

[Text] Is Canada's aircraft industry, which has hitherto operated as an extension of the big American manufacturers, reaching toward Europe with an eye to diversification? That was the question that M. Bernard Lathière, general manager of Airbus Industry, was pondering on his return from Ottawa, where he had gone to deal with his Canadian counterparts over their participation in the program to build the 150-passenger aircraft known as the A-230.

Under the terms of the memorandum of understanding signed last week, Canada's De Havilland would shoulder a 10-percent share of development and manufacturing costs for the new aircraft; a final decision will be taken before the year is out. While the Canadian government has expressed its agreement in principle to such collaboration on both sides of the Atlantic, it expects to secure some guarantees as to the project's viability. Mainly, it seeks dollar-and-cents commitments on economic fallout from the program, especially for Quebec, where De Havilland contemplates building a new plant.

"We aren't going to be satisfied with just rolling sheet-metal," warned one Canadian minister a few days ago. As for Prime Minister Trudeau, who originally urged just such diversification, he has made it quite clear that Canada was not about to get itself into hot water with its American partner, Boeing, which is Airbus Industry's competitor.

While the step just taken in Ottawa may not be decisive, it is nevertheless a most encouraging sign. Financially, it means that, if the deal goes through, the Canadians are ready to underwrite a tenth of development and investment costs, estimated at $1.5 billion.

That is the sum both Boeing and Airbus Industry had to put out to launch their two competing aircraft, the B-767 and the A-310, respectively.

The Canadian decision to participate would be the more welcome now that the Germans, who played a role as important as France's in the A-300 and A-310 programs, are not quite so sure that the time is ripe to go ahead with the A-230. They could reduce their share in this project to 10 percent or so. While the British and the French seem prepared to take on 30 percent of the load, they will have to cast about for other partners in the Netherlands and perhaps here in France as well.

Canada's evident interest in the A-320 at this juncture is good news. The more reason Airbus Industrie has to hope, the more reasons Boeing has to worry. The American firm, which does not, for the moment, contemplate starting production on a 150-seat aircraft, is betting on a stretch model of its B-737 powered with new Franco-American CFM-56 engines. Some think that this 140-seat aircraft, which would be available within 2 years, could fill the size gap at lower cost. Meanwhile, the American builder certainly finds little cause for rejoicing in its Canadian partner's flirtations, especially right after Airbus Industry triumphantly waved an order from Brazil for nine of its A-310s under Boeing's nose.

6182

CSO: 3102/393

BELGIAN PRESS COMMENTS ON CANADIAN A-320 PARTICIPATION

Brussels LE SOIR in French 29 Jul 82 p 7

/Text/ The European consortium that builds the Airbus and Canada's De Havilland company announced last night that they had signed a memorandum of understanding, under whose terms the Canadian aircraft builder will participate in development and production of the new A-320 transport. The new plane is a single-aisle twin-jet plane that can carry 150 passengers on medium and short flights.

De Havilland plans to take as much as a 10 percent share, and thus to become an associate partner in the European consortium, along with Fokker (Netherlands) and Belairbus (Belgium). Under the terms of the MOU, the Canadian builder will be responsible for development, production, and delivery of the parts and component it makes. These have not yet been defined, and several options are being studied.

To John Sanford, president of De Havilland, "this agreement is a major milestone in De Havilland's history, because it will allow us to take our place among the builders of civil air transport aircraft designed to meet the needs of all the world's airlines."

And in fact until now De Havilland has built only 50-passenger regional transport planes -- the Beaver, Otter, Twin Otter, and Dash 7 -- plus two military transport aircraft -- the Caribou and the Buffalo.

Distance Doesn't Count

Once the agreement is fast, the Canadian firm intends to build a new plant, because the Airbus is going to bring in a lot of new business, even as it will for most of the 900 companies that work for De Havilland.

Bernard Lathière, managing director of the European consortium, who signed the MOU, said he was "proud to be able to profit by the Canadians' experience,"and added: "We have already got into the habit of working at the trans-national level. Now cooperation in Airbus becomes truly transatlantic. In any case, these days distance no longer makes any difference. De Havilland's early decision will allow us to factor in its requirements from the very start, even before any final decision as to production distrubution is made. This will enable Airbus to draw without restriction on the Canadian industry's resources and thus -- among other advantages -- to avoid duplications in production."

Nine A-310s for Brazil

Brazil's domestic carrier, Vasp, has just placed an order for nine A-310 Airbuses, thus becoming the first Latin American customer for the new European passenger transport liner. These Airbuses will be powered by Pratt and Whitney jets and can accommodate 214 passengers in first class and tourist sections.

The Airbuses are to replace the old-generation Boeing 727s and 737s on the company's system. Initial delivery is planned for January 1983, and the ninth Airbus will go into service in 1986.

6192

CSO: 3102/393 END

JPRS 81678

31 August 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 118

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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JPRS 81678

31 August 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

No. 118

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BIOTECHNOLOGY

FIRST 'MICROBE BANK' ESTABLISHED IN FRG

Milan SCIENZA & VITA NUOVA in Italian Jun 82 pp 14-15

[Article by M.J.: "Microbes in a Strongbox"]

[Text] The first microbe bank has been born in the FRG. In it are kept, under maximum security, the bacteria Escherichia coli, a few Pseudomonas, and various yeasts. It was not natural scientists fearful about the specimens in their studies who made the original deposits at the "tellers' windows"; it was rather the managers of chemical or pharmaceutical firms, who put into the safe-deposit boxes those microorganisms that have been manipulated, if not completely reinvented, in their laboratories. And they are certainly right to do so, because the microbes involved are worth a great deal.

As is known, the "creation" of bacteria with properties not provided by nature but extremely useful, through the artificial introduction of one or more fragments of genetic material by genetic-engineering techniques, is now almost routine. Among the first inventions, for example, is that of the bacterium which, "instructed" by a human gene, produces the best insulin for diabetics in practically unlimited quantities and at incomparably low costs. It is also possible in this way to manufacture other hormones, ferments and, in short, proteins of the most diverse types.

The institute which, just a few months ago, obtained authorization, in accordance with the international conventions, to conserve microbe cultures is located at Gottingen, in Lower Saxony. There are two reasons why the industries are concerned to keep their creatures "under lock and key." The main reason is to keep control over the patents (which have been granted for a few years now, to protect microorganisms of industrial interest).

Secondly, there is the risk that during the prolonged cultivation of the bacteria, mutations that alter their characteristics might appear. Hence the utility of being able to tap the original stock again.

Apart from the traditional breeding under controlled conditions, there are two conservation techniques: freezing in liquid nitrogen, and a lyophilization process entirely similar to the one used for food; and at the right moment, the precious microbes can thus be "called back to life." At present, about 4,000 different species are deposited at Gottingen.

11267
CSO: 3102/362

BRIEFS

FUEL ALCOHOL FROM STRAW, WOOD—After many years of development work the Munich engineering company Cell Design GmbH, Advisory Engineers VBI started to use a demonstration set-up for the production of fuel alcohol from left over and by-products of biomass. In the "biol" set-up, waste materials like straw, reed, waste paper, or waste wood are converted, by the continuous "biol-process," to sugars which, through fermentation, yield the fuel alcohol, ethanol. The special characteristic of this method, according to information from the company, is that after the process, enough lignin residue remains from the biomass to burn to produce steam and power for the process. Based on the first experimental results and temporary calculations of economy, the Federal Ministry for Research and Technology is reported to have given substantial financial support to Cell Design in Munich for an extensive study of the project and process. Through experiments with grain straw and with eucalyptus wood from Brazil, as well as by planning and calculating an appropriate large-scale plant, it should be determined whether the "biol-process" today allows for an economical production of fuel alcohol to competition with gasoline from petroleum. The result of the study will be presented and published by the end of 1982. According to proposals by Cell Design, the production of furfurol and lignin coke should also be examined with partnership companies. [Text] [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 3 Jun 82 p 7] 9280

CSO: 3102/329

ELECTRONICS

GOVERNMENT FUNDING FOR ELECTRONICS INDUSTRY DISCUSSED

Paris LE MONDE in French 30 Jul 82 pp 1,19

[Article by J.-M. Quatrepoint]

[Text] The government has decided to make the development of the electronics industry the industrial priority of the next five years. A five-year investment program of 140 billion francs will be implemented, of which the state would assume responsibility for about 55 billion francs.

After the nuclear program under the Gaullist government, and after the telephone under Giscard d'Estaing, the development of the electronics industry will be the grand industrial design of Mr Mitterrand's seven years.

The government and enterprises will have to boost their financing effort by about 50 percent in constant francs for the 1982-1983 period in order to bring to 140 billion francs the total investment of the electronics industry for the next five years.

This is an effort which will make it possible to create 80,000 jobs in a sector that currently has 320,000, and to recover the equilibrium of its trade balance, which has an annoying tendency to degrade.

These are also goals that could apply to many other industrial activities. Why then give electronics the highest priority? "This is not a case like any other," explains the minister of research and industry. "Through the electronics industry, it is the future of our industry as a whole that is brought into play."

A sector of the future, with a rapidly expanding market, electronics is infiltrating all other human activities, and in fact determines the modernization of the industry as a whole (without electronics, no robotics or productics), not to mention its influence on the production of cultural products.

"We have no choice," the minister goes on, "because the rate of technical progress is imposed upon us by international competition." As the token of a "certain industrial determination," the electronics industry plan must thus allow the French industry to maintain contact with its Japanese and American competitors.

This awareness of electronics' strategic nature, which was largely awakened by the work of the electronics industry task force, has culminated in an action program spread over several years, exhibiting four facets: research, industry, utilization, and training. Three of these aspects were presented Wednesday at the Council of Ministers.

In research, and as predicted (LE MONDE of 29 July), nine large national projects combining industrialists and public laboratories, were retained from the 14 proposed by the electronics industry task force.

Actions will be started to disseminate electronic applications in industry and the business sector (electronic money for instance), and to provide managements and the public sector with "quantitative and qualitative objectives for using information technology."

The Ministry of Research and Industry feels that "training is one of the major bottlenecks of the industry."

The annual shortage is estimated at 1100 engineers and 3000 senior technicians. A plan will be formulated to close the gap by training more than 4000 people in three years.

Various other measures, among which the creation of national higher education institutes, should produce an annual influx of an additional 4000 graduates.

For completeness, this program still lacks its industrial facet and its financing plan. The latter is actually more or less determined, at least in its major features. But a discussion arose in recent days within the government, about the political advisability of making these figures public.

Would it not have shocked a portion of the population to read about state aid for the electronics industry at the very moment when austerity is the order of the day? Moreover, the Ministry of the Economy and the budget department are shuddering a little at the bill and resisting obligations spread out over several years. The chief executive ultimately settled the matter: he asked that the figure of 140 billion francs be announced, so as to emphasize the magnitude of the program.

Financing Plan

The 140 billion include the financing by the state, private and public enterprises, or subsidiaries of foreign groups, for the 1982-1986 period. If the curve had maintained its present slope, the investments would have amounted to only 90 billion. This means that an additional 50 billion francs are being envisaged.

The government would normally have contributed 25 billion francs for financing; as it is, its participation would come to 55 billion. The state will therefore have to find an additional 5 billion (constant) francs each year for the electronics industry.

Telecommunications and professional electronics already have the highest investment budgets with financing from the armed forces and PTT (Mail, Telegraph, and Telephone). It is expected that this investment effort will simply be maintained for the next five years, which will still represent 80 billion francs out of the 140 billion.

The distribution of the remaining 60 billion francs among the nine sub-sectors of the industry has not been finalized. However, orders of magnitude can already be given.

Components, 10 billion francs; consumer electronics, 7 billion; informatics, 13 billion; office automation (excluding CII-HB), 1.7 billion; software and informatics services, 4.5 billion; space industry, 15 billion; industrial informatics and automation, 3.2 billion; scientific instrumentation, 2 billion; and medical electronics, 3 billion.

If these investments are compared to current ones, or to the ones that were normally expected, we note that the additional effort will primarily benefit informatics, components, and consumer electronics.

The industrial aspect still remains to be decided; an essential, and far from delicate task. We are told that by September, when everyone returns from vacation, it will be an accomplished fact. Discussions with the industrialists are continuing, and boundary problems among the "gang of four" nationalized companies--CGE, Thomson, Matra, and CII-Honeywell-Bull--who provide 50 percent of the industry's production, are still far from being solved.

In Mr Chevenement's conception, this industrial facet does not have to be limited to the public sector and to France. PMI (small and medium-sized enterprises), the private sector, and even French subsidiaries of foreign groups, must fully participate in the development of the electronics industry, and the state will reach "conventions" with enterprises that want them.

And finally, the government insists on the necessary international cooperation, with priority for the European side. "To refuse a slot policy for the electronics industry does not imply that France will do everything by itself, because in some cases the tasks can be divided within Europe." These are words which echo the "European overtures" of Max Grundig and of the new Philips head executive, Mr Deeker. So far, these inclinations toward cooperation remain simply words. Will they translate into concrete actions?

11,023
CSO: 3102/408

FRG REPORT FORESEES NINE THOUSAND ASSEMBLY ROBOTS BY 1990

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
7 Jun 82 p 7

[Text] Frankfurt, 6 June--By the year 1990 approximately 9,000 industrial robots will assemble products in the assembly areas of German companies, most of which today are still produced by man. That is the result of a study of the Frankfurt Marketing Research Institute Gewiplan on the field "flexible automatic assembly systems." This is not a matter of the already widespread kind of robot used mainly in the automobile industry to weld, lacquer and move parts, but a matter of systems which automatically accomplish the changing-operations in the assembly of parts that have to be sorted differently.

The area of assembly still employing some 400,000 people today, has to be regarded as one of the greatest automation potentials for production technology. According to calculations of the institute, by 1990 approximately half of the assembly tasks in all branches of German industry will be automated by the use of robots and automation systems. Earlier studies on the use of industrial robots came to the conclusion that for each new job at least two would be eliminated. However, reliable findings are not yet available.

At present, according to estimations by Gewiplan, a total of 1,500-1,700 industrial robots are in operation in the FRG. By 1990 the number is expected to increase twentyfold and the greatest part of the increase will be in the assembly area. For the companies which plan to operate in this market it is, however, according to the opinion of marketing researchers, most important that complete systematic solutions be offered to assembly plants with numerous single stations of highly differential constructions. The 9,000 assembly robots by the end of this decade are, according to the prognosis, only part of approximately 8,000 flexible automatic assembly systems which, all in all, will include some 200,000 assembly stations. The size of the German market for the flexible automatic assembly systems is estimated by Gewiplan to be about DM 30 billion for the period of the next 8 or 9 years.

The obstacles to the growth of automation and robots in the area of assembly are, according to the findings of marketing researchers, not only technical problems like the production of appropriate sensing devices, but missing information on the part of the potential user, the "anti-automation" assembly

organization, and the construction as well as the complexity of some products. According to the estimation of Gewiplan, the assembly systems will most probably succeed in the automobile industry. Automation is expected to be most difficult in machine tool construction because the highest demands are placed on the flexibility of production and the individuality of the products.

9280
CSO: 3102/329

EUROPEAN PARLIAMENT PRESENTS REPORT ON RESEARCH COSTS

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
28 May 82 p 7

[Text] Frankfurt, 27 May--The Committee for Energy and Research of the European Parliament has presented a report which deals with the common research policies (3/29/1982 PE 74527). Comparing the European Community with the United States and Japan, it turns out that the part of the entire civil research expenses of the gross national product amounts to 1.7 percent in the European Community, 1.7 percent in the United States, and 2.0 percent in Japan. Thus Japan spends the most, in comparison, for civil research and development. The state research expenses of the European Community for 1980 are shown by the following table (in millions of ECU):

Country	Total	Civil Amount	Civil (In Percent)
FRG	6,308	5,572	88.3
France	4,542	2,938	64.7
Italy	923	895	97.0
Netherlands	1,049	1,017	97.0
Belgium	469	467	100.
Great Britain	3,135	1,459	46.6
Ireland	57	57	100.
Denmark	243	242	100.
Europe	16,726	12,646	75.6
EG-Commission	238	238	100.

It turns out that in the European Community only 75 percent of the state research expenses are set aside for civil research and development. This is

basically due to the behavior of Great Britain and France, where military research and development still play an important role. Within the European Community three countries, namely the FRG, France, and Great Britain combine 80 percent of the research expenses of the state. Also interesting is a comparison of energy research with overall research. Here it turns out that within the European Community the state expenses for energy research amount to around 14 percent in comparison with the funds for civil and other research and around 23 percent in the United States. But the energy research is proportinally supported more in the United States than in the European Community. Nuclear energy research still dominates with 75 percent of all state energy research funds.

9280
CSO: 3102/329

FRANCE'S INDUSTRIAL RESEARCH EFFORT ANALYZED

Chevenement Appointment a Signal

Paris LE NOUVEL ECONOMIST in French 5 Jul 82 pp 42-47

[Article by Sophie Seroussi: "Properly Applied Research"]

[Text] M Jean-Pierre Chevènement's appointment as minister for industry is not merely a political event. It may well signal a turnaround in the government's industrial strategy.

Research has won its all-out push to get the upper hand over industry. Did M Jean-Pierre Chevènement really hope for such total victory quite so soon? To be, at 43, the boss of his country's research and industry, bracketed together into a super-ministry strong enough to slip off the old Finance Ministry leash? A 1963 graduate of the prestigious Hautes Ecoles Nationales, an activist in the French section of the Workers Internationale (SFIO) in 1964, founding father of the Center for [Socialist] Studies, Research, and Education (CERES) in 1966, the man who negotiated the Joint Program in 1972, elected to Parliament as deputy for Belfort in 1973, M Chevènement has changed his image since he became Minister of State in 1981. Prior to that time, the doctrinal guru of the PC-PS union made businessmen uneasy. Today, he fascinates them. Can today's minister for industry felicitate himself on the job done by yesterday's minister for technology?

An ecumenical gathering of the research community last winter in Paris, an ambitious legislative package for research this summer, speeches from the president, from ministers, from experts or from employers -- all combined to annoint M Chevénement: the technology offensive is perceived today as the panacea that will cure unemployment, halt the recession, put an end to hunger everywhere in the world, and solve the energy crisis. And yet the unshakable M Jean-Pierre Chevènement goes right on driving home the message: "What we ought to be afraid of isn't talking too much about technology, but not talking enough about it!" He c n relax now.

Above and beyond all the words, when it decided to boost domestic research and development spending up to the level of the other industrial powers -- 2.5 percent of the GDP by 1985 -- the government signalled its firm determination to trade talk for action.

For French industry, it was high time. Every year, for every patent application filed by a Frenchman, the British file almost two in their own country, the Germans three, the Americans six, and the Japanese and Russians around fifteen. Along with that comes a corollary: the alarming increase in the number of foreign patents taken out in France, which now account for 75 percent of the total, and sometimes more than that in such key sectors as chemicals, pharmaceuticals, electronics, or computer sciences. Why? Lack of money. In 1981, France devoted only half as much money as Germany to industrial research, and only a quarter as much as Japan. As of now, the money is going to be there. The research orientation and planning bill, which has just passed the Assembly, makes it clear that from now on "industrial research will be vigorously encouraged." A twofold effort is needed. From the state: funding for technological development must increase by 60 percent, as against the 44 percent of previous years. From industry: the volume of research must hit 1.5 percent of GDP by 1985, instead of today's paltry 0.7 to 0.8 percent.

In industrial research, as in any other endeavor, if you set out to succeed it is better to be big, rich, and smart. That means that the nationalized corporations will be right out there on the front line. The grand strategic maneuvers that surrounded the nationalization campaign let that be clearly understood. Thomson, CGE, Rhône-Poulenc... all of them must join in and generate a synergistic effect on other corporations. M Chevènement can play on the biggest keyboard ever entrusted to a single minister in any Western economy. In the course of his passage to Research, he had the chance to try three avenues of intervention in the industrial fabric. He comes back to them today as the minister in charge of giving the key production areas -- the nationalized sector, the innovative PMIs, and the applied research centers -- a shot in the arm.

The channel of choice will be the nationalized corporations. Like his friend Alain Gomez, president and general manager of Thomson, the new Industry Minister may tend to exaggerate a little when he talks about their ability to pull others along in their wake. But what inner resources? Take one example among many: ELF-Aquitaine.

With a research staff of 2,000, four major research centers for chemistry and energy and soon to have a fifth devoted to biotechnologies, plus a 1982 budget of 1.5 billion francs, the National ELF-Aquitaine Corporation is a model of its kind in the area of industrial research. At ELF, research is a total attitude instilled some 20 years ago by its boss, M Bernard Delapalme, 59, a Polytechnique graduate. He is a one-man band. He was the seagoing genius who presided over the cruiser Jeanne d'Arc, who ran the Nuclear Studies Center at Grenoble, who held a chair in electronics -- and all the miscellaneous milestones of his career made him a member of every research commission, council, and mission. The mischievous eye that looks out through those horn-rimmed glasses tells you at once that he is not a man to rest on his laurels. You have only to see him and listen to his feverishly enthusiastic

talk to understand that he applies this perpetually questioning approach at ELF to research. The oil companies are caught in a nasty bind. On the one hand, their raw materials supplies may well become even dicier. On the other, their customers are constantly devising elegant new ways to get along without what they have to sell. Already doomed, sooner or later, their business is crumbling away. Something like a grocer who has no more stock and no more customers, they must reconvert or perish.

Ever the realist, M Delapalme explains: "Research simply doesn't exist unless it is pulled into being by the demands of the market. Anyone who directs research for a big group must constantly make sure that he is accessible to what is going on inside his own shop as well as outside." And, to maintain that precarious balance, he has a secret that he calls the "3 Ss." Specific, strategic, and savage [wild], research at ELF operates on three levels:

Specifically, it responds to the group's immediate needs in the areas of exploration, refining, and industrial development.

Strategically, it forecasts future requirements. Ten years ago, when SNEA's board decided to invest in marine and under-water exploration technologies, that was a sound strategic choice. Today 40 percent of its production comes from the sea, while the worldwide average is 20 percent.

In the long run, ELF devises scenarios which, once tested, can become strategic choices. This wildcat research gets all of 10 percent of the research budget, with the rest evenly distributed between short- and medium-term research. Despite its small budget, wildcat research is far from being underestimated. Its driving force, M Charles Vernet, 58, is an old hand at research who lived through the glory days -- now gone forever -- of oil protein research at British Petroleum. "This antistructure we have leaves the door wide open to creativity," says M Vernet. "All it has actually done is to legitimise all the free-lance research that has always gone on in every industrial research laboratory in the world. It is a research man's right, and his duty, to ask questions outside the confines of any pre-established program. Our job is to go fishing for ideas." Wondering what made the Nile mud so fertile led to work on plant nitrogen fixing and to new markets in fertilizers. Wondering about ways to preserve the ancient monuments of Babylon led to new hardening and consolidation products for the construction market... and to a privileged relationship with the Iraqi authorities -- something that, to an oilman, is not to be sneezed at. Such techniques as slant drilling and enhanced oil recovery, the early interest in biotechnologies and new sources of energy -- all these, at ELF-Aquitaine, came out of the crucible of wildcat research.

In the other major conglomerates, the approach may not always be quite so original as that. Nevertheless, all of them are investing

considerable sums in research and development. Thomson has one of France's top-flight strike forces in research, with a budget of 4 billion francs and 15,000 research people on its payroll. Renault, PUK, Saint-Gobain, Aérospatiale, etc. put 2 to 4 percent of their volume of business into research.

A dynamic center for technological development must, above all, benefit the others. How? With men, with structures, or with money.

As for the men, M Delapalme preaches the swarming theory. Utterly convinced of its soundness, he says: "The Anglo-Saxons have more and more companies which, like ICI and General Electric, let their employee-entrepreneurs go out on their own, and help them set up their own businesses. If this were tried in France, with a safety net -- no point in playing the ostrich here: we have little taste for taking risks -- the system could work." That safety net for middle-management candidates for starting a company might be the promise of their jobs back at the parent company if the new venture failed.

As for technical and financial help, there are formulas for getting it already at SNEA. Le Cetre, the technical center for the Aquitaine region, makes its facilities available to local firms. M Francois Bernard, M Delapalme's deputy, explains: "In the 2 years it has been in existence, the track record is already very encouraging. Out of 134 requests for technical help, more than half come from PMI-PME [small and medium industry and business] with fewer than 50 employees."

Another special arrangement to encourage innovation is an ELF subsidiary known as INOVELF, which has already invested some hundred million francs in innovative projects devised by such small and medium companies as Goupil in data processing or France Embryons in biology. ELF even has a brand-new "venture" subsidiary in New York, called Elf-Technologies, Inc.: for the last few months, it has been investing in technologically advanced companies in the United States. "Using the venture-capital approach, we hope to get some financial return, of course," explains M Jean-Francois Saglio, director of innovation and research support. "But what interests us even more is the industrial return."

No. This one of "Delapalme's boys," as he describes himself, a graduate of the School of Mines and a deserter from the Ministry for the Environment, has some very specific -- and not very gentle -- views on French-style venture capital. Because they are overcautious, the corporations who set up to finance innovation would never, in his view, have allowed Apple to be born. Before you talk about venture capital to stimulate industrial research and development, "The Question," as he says, is this: "Are the French innovators businessmen?" And since the answer is often "no," we need other avenues for financing.

If your name isn't ELF-Aquitaine, when you have neither its organization nor its money, research is still something you have to do. Every business has the same requirements. You have to change, to adapt, to innovate if you are going to stay competitive and survive. Everybody in industry is concerned. "We no longer have cutting-edge sectors on one side, traditional sectors on the other. That notion is completely outdated," says M Maurice Allègre, known as "Mr Industrial Research" at Chevènement's ministry, where he is in charge of DESTI (Scientific and Technological Innovation Development). He continues: "Companies that fail to understand that they must apply the new technologies in their plants will inevitably be left high and dry."

There is no appeal from that verdict, for the big any more than for the small fry.

All the surveys and studies prove that the PMIs, thanks to their ability to move quickly into new markets, seem to have more technological get-up-and-go. Or, maybe, that big conglomerates behave differently. In a cutting-edge sector, their goal is frequently to develop a new manufacturing process, which means that the admission fee in terms of research and development is going to require investment of several hundred million francs over a period of some 5 years. The PMIs, though, given a few million, can develop one step in a process or one product in a single year.

Acceptance

Founded in 1979, EPI (Expansion Plastics International) is an incorporated subsidiary of the Limagri Corporation. EPI makes permeable trays and cartons of expanded polystyrene. Limagri markets these products to fruit and vegetable dealers, slaughterhouses, supermarkets, and, above all, to SOCOPA. A small Avignon PMI with 50 people on its payroll, Limagri in 1981 did 12.5 million francs worth of business. Two years ago, it got the idea of mass-producing expanded polystyrene cartons with a metal-coated botton. Total Investment : 3 million francs. In a short time the new product was enthusiastically accepted, even in foreign markets, where negotiations for licences to manufacture are now going on, and enabled the company to stand up better to its competition. EPI is trying now to diversify into a housing insulation system using expanded polystyrene.

EPI found the financing it needed at Anvar, the National Research Marketing Agency.

To hear Anvar's director for industrial development, M Albert Vartanian, tell it, finding the money isn't the hard part. "Any clever and resourceful man can find it," he thinks. "We have already counted more than 50 sources of financing: little specialized lenders in every sector. In telecommunications, the military, and

in places like the energy management agency, Anvar, and all sorts of special deals (medium-term innovation loans from Inodev, which is the capital loans subsidiary of the PMEs)-- any serious project can find somebody to back it." Supporting evidence: the 700 million or so francs Anvar handed out to 1,800 innovative companies in 1982. Among them, three fourths were PMIs. Despite all this, there are only a bare 1,300 companies engaged in research in France and there ought to be 5,000. Furthermore, the statistics on the whole matter are shaky, to say the least. Just where does industrial research begin, and where does it end?

"We do have a certain tendency to add apples and oranges," notes M Vartanian. "Few companies are making real research efforts. They are merely improving the products they have, and that's all." Research spending in most companies scarcely tops 1.5 percent of their volume of business. That being the case, we must admit that few French industrialists are willing to emulate M Georges Bret, president and general manager of Quantel. He built, sold, delivered, and repaired his first lasers himself, in a little workshop no more than 20 square meters in size. Today, with an annual volume of business of 42 million francs and an American subsidiary that brings in 60 percent of its sales, Quantel is one of the world's leaders in its special field. This onetime professor of quantum physics on the University of Paris faculty does admit -- with some false modesty -- that he is tired of constantly being held up as an example along with a handful of others. "It's flattering, but hardly representative: we are exceptions," M Bret agrees, but he, too, deplores the lack of "entrepreneurial" spirit among the French. "When I hire a Frenchman, he asks me all about company fringe benefits. An American wants to know about stock options. Just look at the names of the great French or foreign corporations: Renault, Dassault, Michelin, Bell, Hewlett-Packard. They all began with real men, builders, creators."

For those who are not potential Brets, nor yet Renaults, their best bet is to rely on imaginative structures. In industrial research, there are some. Not very many, perhaps a dozen, at most, in all France, but they exist. They are the private research centers that work on contract. The most illustrious among them are Hydromécanique and Frottement, Metravib, and, first of all, Bertin, the biggest in Europe, known to the general public through the Aérotrain and the Naviplane. Unlike the professional technical centers, which work for their own particular sectors (wood, leather, or welding), the contract shops, with their respective pools of expertise (friction, vibration, or mechanics in the broad sense) shower all sectors of industry with their ideas. Example: the ink-jet printers developed by Bertin, which are now standard equipment in all the postal sorting centers in France and imprint 2,000 bar-codes per second. The major problem was frequent clogging of the minute orifices through which the ink was expelled. It was solved by applying a technique originally developed for the aircraft industry. One of the team engineers remembered that, in

some turbojets, the fuel is ejected through radial holes drilled in a revolving disc. Owing to centrifugal force, the diameter of the jet is far smaller than the diameter of the hole. With rotating openings that were not so very tiny, you got less clogging and more reliable printers. The hunch paid off.

Self-Feeding

"Only a background of experience in all directions, exploited in a horizontal structure like ours makes such technology transfers possible," claims M Georges Mortchelles, general manager of Bertin. "From satellites to housing, from nuclear technology to printing, the fabric of industry must feed itself technologically." At Bertin, a team of engineers who provide the interface between research and industry takes care of that. It is no accident that the team is part of the marketing service headed by M Daniel Breford.

It is, if you will, the antithesis of the professional or trade technical centers, so often disparaged, sometimes sclerotic: financed principally through parafiscal taxes, the trade centers are supposed to provide the benefits of their research to all members of the trade. It is hard to see, under these conditions, how they could give one particular company the technological "edge" that might swing a bigger share of the market its way. Industrial secrecy, like noblesse, "oblige."

With the private research contract centers, though, that is altogether possible. In 1968, the Douarnenez Metallurgical Company, a little family-owned PMI, came to see Bertin with a few handmade samples for a new self-opening sardine tin. Specializing in small-size tinplated steel cans, the company was worried about competition from the new manually opened aluminum cans. The meeting with Bertin allowed it to move up to industrial scale. Machines and product units were developed. Can production leaped 50 percent! The investments required made it necessary for SMD to merge with PUK. That was the beginning of the Franpac Company, which today controls 30 percent of the market. While retaining rights to the process for small-size tins, it gave a licence to Carnaud, the French leader in tinplate cans, which now uses the process abroad.

There is always a PMI among Bertin's 20 top customers. The major sources of revenue, though, are ELF, Saint-Gobin, Usinor, SNIAS, and government agencies (the ministries, Anvar). The fact is that a company like Bertin -- 175 million francs worth of business in 1981 -- lives mainly on government contracts.

As a partner in most of the big national programs, it derives most of its financial resources and its technical expertise from them. Its work on Pierrelatte made it knowledgeable in gaseous diffusion, which it then applied to the design of artificial lungs and kidneys, and in ultracentrifuging, which it transplanted to cleaning up oil spills.

INVENTIONS FROM FARAWAY PLACES

Sectors of Industry	Total Number of Patents Filed	Percent of Foreign Patents
Mineral chemistry	2,381	85
Organic chemistry (1)	13,204	90
Pharmaceuticals	12,247	82
Parachemicals (2)	6,813	88
Paper	1,237	83
Consumer electronics (1)	3,204	82
Data processing	2,709	78
Precision machinery (1)	15,511	80
Textiles	5.690	82
Office machinery	175 (in 1978)	83
Robots	95 (in 1978)	78
Metal processing (1)	5,268	76
Fuels (2)	2,627	79
Electrical equipment (1)	15,917	72

(1) Except for the year 1979.

(2) Except for European patents

Source: CES

Who holds these patents? In order, the Americans, the Germans and the Japanese.

What all these sectors have in common is that they are highly capital- and research-intensive, and have high rates of profit. In a word, they are the best.

Such prestigious innovations as the Airbus or the Antope remote data-processing system are one thing. High technologies applied to everyday life are another. They do not turn into the "deal of the century," yet they are the real reflection of the level of scientific and technological advancement in an industry. And an index of its economic health. Without this indirect fallout, the big programs -- whether or not they are trend-setters -- do not beget growth, nor jobs, nor progress. Dear to the heart of our President, that hoped-for triad will materialize only if the programs are right on target.

"There must be a synergy set up between national policy and the needs of industry," M Mortchelles maintains. "An industrialist is ready to pay for adapting new discoveries to his particular problem. He is not willing to pay for making them." That is why, determined not to be left on the sidelines at the rebirth of French research, Hydromechanique et Frottement, Metravib, and Bertin formed an association on 1 February 1982 to get recognition for their profession: industrial research. Tirelessly their directors, Messers Jacques-Jean Caubet, Jacques Martinat, and Georges Mortchelles are carrying the good word from ministry to ministry. Will anybody listen?

No question about it: the time has come for gangways to drop between research and industry, between the public and the private sectors. The CNRS already has a committee on industrial relations, a kind of club where research and industry people can get together and talk. It is fielding a network of regional chiefs of mission to guide the PMIs through the labyrinth of its 1,150 in-house laboratories. The Center for Atomic Studies is also accentuating its availability to industry. And still another successful industrialist, M Yves Sillard, has been named to head Cnexo (the National Center for Ocean Exploitation). On every front there is a concerted effort to translate scientific knowhow into technological knowhow.

Still to be found, though, is a common language. Where an industry type will talk about "uneven air circulation around products to be dried," the scientist will say "flow-modelling in a porous medium in the presence of heat convection." Absent such a lingua franca, shall we have to start training interpreters?

There is no point in fooling ourselves: our trade deficit in manufactured products with the three dominant industrial powers, the United States, Federal Germany, and Japan, is in direct ratio with the number of patents filed by each of these countries. The leaders in technology are also the leaders on the world's markets.

Industry Minister Interviewed

Paris LE NOUVEL ECONOMISTE in French 5 Jul 82 p 45

/Interview with Jean-Pierre Chevenement, minister of industry, by LE NOUVEL ECONOMISTE: "France will Be No 3 in Technology by the year 2000"/

A third of the products that will be on the market 5 years from now do not yet exist. This is the idea M Jean-Pierre Chevènement plans to use to convince French industrialists that their competitive position tomorrow depends on their research effort today.

[Question] In these times of budgetary austerity, how do you hope to achieve your goal of earmarking 2.5 of the GIP for research in 1985?

[Answer] The mere fact that we are experiencing a recession right now does not mean that we must cut back on our research effort. Quite the contrary. That civil research budget (25.4 billion francs, a thirtieth of the total state budget, one half the total research budget, which also includes military research, university research, and research financed by the Postal and Telecommunications Ministry) is going to bring the 17.8-percent annual growth in volume called for under the planning act for the years 1983, 1984, and 1985.

The 1985 research budget will thus come to better than 41 billion 1982 francs. But, above and beyond the government effort, passage of the orientation and planning act will permanently mould habits and behavior patterns. In less than a year, we have given ourselves a strategy and a legislative arsenal scaled to the effort that will make France the world's third-ranking scientific and technological power by the year 2000.

[Question] Just how can you increase the industrial research effort by 8 percent in volume each year?

[Answer] It is up to the corporations to anticipate and understand the nature of the technological challenges they will have to deal with. A third of the products that will be on the market 5 years from now don't even exist yet. Technology is a vital component in competitiveness.

Of course, we are determined to encourage the shift. Through credit. Through tax incentives. We are already discussing one incentive measure with M Fabius.

I will also be watching to make sure that the staff people here at the Research and Technology Ministry bring a little leverage to play on what individual companies plan to do. All nationally

owned corporations will be getting firm directives telling them to bring the private sector into the picture on their progress -- especially their subcontractors. There are not nearly enough French companies doing research activity. Our industrial research will have to catch up with Germany and Japan.

[Question] Do you really feel that the innovation finance agency has sufficient clout?

[Answer] Besides the Anvar staff, we have to mobilize the whole banking system. That is the assigned role for Inodev, which will shortly be expanding its capital. We are aiming at two objectives:

* By lowering the medium-term interest rate to 15.5 percent, we shall be offering all the banks a finance package that will be attractive to industrial customers: the rate at which Inodev is getting applications right now proves that.

* Furthermore, we hope that Inodev will help, by granting participatory loans, to revitalize the budgets of innovative companies.

Finally, it is absolutely indispensable for the government to encourage the growth of small, high-technology firms based on the ideas of one man, or a small team, but requiring considerable financing to get started. The innovation financing agencies and the regional development agencies invest no more in this kind of undertaking than about 150 million francs a year. We are working now with the Ministry for the Economy and Finance on setting up some joint funds for limited-term loan placement.

[Question] The main criticism aimed at your policy by industry circles has to do with this decision to set up mobilization programs, which they call both too trendy and too vague.

[Answer] The mobilization programs -- seven of them -- are an essential innovation in law. They will enable us to plan and to pool efforts in a whole array of clearly defined "national projects," which will be able to transform themselves legally into the new "public interest groups" with their own objectives and adequate financial means keyed to their timetables.

The partners in these undertakings will be brought into their design and the follow-up on it. We must make sure they can handle key technologies (such as manufacturing integrated circuitry in electronics, for example), develop basic research (such as microbiology for the biotechnologies), or significantly transform working conditions, cooperate at the scientific level with developing countries, and spread scientific learning. Finally, there is a program for technological development of the fabric of industry, which was designed specifically to start technological research and development on key techniques which concern all of industry.

[Question] A lot of people say that you have a "Gaullist" view of France's scientific and technological independence. How do you reconcile that view with your determination to open up to the international market?

[Answer] General de Gaulle developed the cutting-edge sectors involved in defense (nuclear, weaponry, aviation, space). Today, the technological challenge is everywhere. The "arsenal" strategy is no longer adequate. We must at one and the same time keep the world market in our sights and loosen the outside constraint. France's place in the world, in what is sometimes called the international distribution of labor, will in fact increasingly reflect her place in the international distribution of knowledge.

Starting with the development of new technologies, the goal is at once to recapture the domestic market and to increase our shares of the world market. But none of this will be possible at all without the political will to do it, and without popular support.

6182

CSO: 3102/394

BRIEFS

ASSOCIATION FOR SCIENTIFIC EXCHANGE--The Association for the Development of Scientific and Technical Exchanges between France and Japan (ADEFJAST) has publicly announced its recent formation. Founded "at the initiative of research people, university faculty, and those in charge of scientific and technical matters in French industry, in both the public and private sectors, who are engaged in long-term professional activities with Japan," ADEFJAST is headed by M Jacques Ruffie, member of the Academy of Medicine and professor of the Collège de France. ADEFJAST's board of directors lets it be known that it will allow itself a year to "examine the feasibility of a Franco-Japanese association for sciences and technologies, which assumes, among other things, setting up a corresponding Japanese branch," and to "do some consciousness-raising among small and medium enterprise circles." The association's bureau will publish a scientific and technical newsletter on Japan for its members. [Text] [Paris LES ECHOS in French 13 Jul 82 p 6] 6182

CSO: 3102/394

FRG DEVELOPS SAIL-POWERED CARGO SHIP FOR INDONESIA

Hamburg DER SPIEGEL in German 26 Jul 82 pp 56-57

[Text] Do sailing ships have a new future as freighters? An energy-saving cargo carrier has been developed in Hamburg.

For windjammer enthusiasts the sail-powered freighter, which was darting about as a 1:9 scale model on the Ploener See in Holstein on its maiden voyage for test purposes, was a disappointment.

The "Indosail" project has neither the majestic bearing of a "queen of the seas," which "is flying along under the cloud of her sails"--as the Australian sailing writer Alan Villiers writes enthusiastically of the legendary clipper, the "Cutty Sark" (built in 1896).

The ship, designed in the Hamburg Experimental Institute for Shipbuilding, does not come close to the "most magnificent in the endless list of sailing ships ever"--which is the judgment of the German biographer of the great sailing ships, Horst Hamecher, on the "Preussen" (built in 1902). The five-master, with its 8,000 tons capacity, was the biggest and fastest square-rigger of all time.

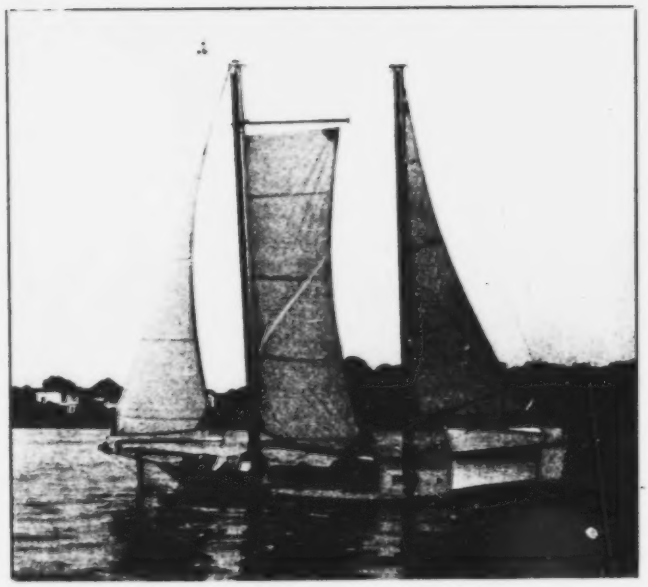
Compared with such beauties of the sea, the tub which was developed with budget funds from the Ministry for Research for the island state of Indonesia, is ugly.

Optically the hull is dominated by a squat deckhouse on the stern for the crew's accommodation and the bridge. The harmony of the sails in the modified gaff rig is broken by the huge rectangular mainsail--a concession to the results of wind tunnel tests, which gave the best figures for this cut, and to the plans for full mechanization of sailing ship operation.

With the aid of electric motors or a hydraulic system, the sails are to be set, taken in and reefed--reduced in size--in high winds in less than 1 minute, by one man if necessary. The principle used was borrowed from modern yachting: At the back of each mast there are vertical rotating tubes on which the sails can be rolled in and out, like curtains on the roller of a blind.

The difference about "Indosail," the abbreviation for a program called "Development of Sail-Powered Freighters for Indonesian Island Traffic," is: Of all the projects

that have been thought up since the explosion of oil prices to revive freight shipping under sail, the Hamburg-Indonesian project is probably the closest to becoming reality.



Indosail Model: Competitive Today

The 25-meter long hull for a test ship following the "Indosail" design is already under construction in Indonesia. In 1 or 2 years the prototype of a series of sail-powered freighters is scheduled for launching. It will be of 2,000 tons, about 65 feet long and, unlike the 5-meter long model and the test ship, be fitted with three or four masts instead of two. Ships of this type are thought of as replacements for coastal motor ships of about the same size which have been used until now in island trade in the Indonesian archipelago.

The large number of crew required in proportion to the load capacity, the unavoidable, often extremely hazardous back-breaking work of the crew members among the masts and spars, clumsiness in maneuvering, but most of all the lack of punctuality determined by the wind, caused the great freight-carrying sailing ships to lose the contest with the steamer and later the motor ship.

Certainly many clipper ships, with their broad spreading spars and angular hulls, which were considered to be the peak of the art of building wooden ships, or sailing giants like the "Preussen"--which was lost in 1910 following a collision with a

steamer which had underestimated her speed--over short distances and under favorable wind and sea conditions, could have left behind even an average modern freighter, capable of 16 knots.*

But over the long term and viewed over several trips, even the "Preussen" and other steel-hulled "Flying-P-Liners" of the Laeisz Shipping Company in Hamburg--such as the "Passat," which is now tied up in Travemuende as a floating monument or the "Padua" which is today the schoolship "Kruzenstern," flying the Soviet flag--managed only a maximum of half the speed of an average modern freighter.

Their captains would not have been able to guarantee times of arrival calculated precisely to the day, even to the hour, as is usual today on the regular routes, even taking long-term averggge figures into account--because the wind and the weather were not always predictable, even for the most experienced seamen.

However, in the meantime speed is no longer everything for the shipowners. In 1970 1 ton of heavy oil for a ships's diesel cost about $ 16. Today it is traded for about $360. The share of energy costs in the total operating costs of a freighter increased in this time from about 10 percent to as much as 40 percent.

Today newly built freighters, the so-called multipurpose freighters, are equipped with engines which are designed for a speed of 14 knots, compared with 16 knots just a few years ago--30 percent less power is required.

Owners of container ships, the fastest freighters, had entire engine installations removed: The container giants of the "Tokyo-Express" class, owned by Hapag-Lloyd, which previously had two engines, each of 40,500 hp, and were capable of 27 knots now have only one engine and can reach only 23 knots.

It was not only the price of oil that weighed increasingly in favor of a return to free energy in maritime transportation traffic: Through the use of materials and technologies that were unknown to our ancestors, ship operation could be adapted to sail-powered freighters more efficiently. The findings of aerodynamics make it possible to provide an optimal shape for the propulsion unit, that is to say, the sails. As a result of the long-term weather forecasts that are possible with the help of satellites and the course that is selected with this in mind, the captains of sail-powered freighters could largely eliminate the imponderables of wind and weather, and since the mid-1970's an entire army of patient inventors and dreamers, engineers and oldtimers from the industry, who cannot forget the faded memory of majestic ships, has been planning the renaissance of the windjammers.

Windmill ships were designed, which could even sail against the wind, even if it was only in a light breeze. Ships with vertical rotors were put down on paper, in which the wind was initially to generate electricity which then powered the ship's engine.

Licensees, among them some in the United States, are experimenting with the "Dyna-Ship," which was created in the 1960's by the Hamburg engineer Wilhelm Proells and which is still considered by the experts to be one of the most promising projects:

One knot: 1 nautical mile (1. 852 km) in an hour.

Proells designed a wind-powered bulk freighter, with a capacity of 17,000 tons, and whose enormous sail area of 9,600 square meters ("Preussen": 5,500) is carried by six rotatable masts of elliptical cross-section. By computer simulation the ship has been commuting on paper for 1 year across the north Atlantic from Hamburg, it achieved a respectable average speed of 11 knots--equipped with an auxiliary engine for calms. The costs per ton carried were about one-third less than with a comparable motor ship.

Nostalgia overwhelmed the originators of dozens of other projects in their thinking. The Hamburg captain and Elbe pilot Wolfhart Schoenfeldt, who recently revealed his idea of a 12,000-ton capacity five-master, makes concessions to technical progress: auxiliary power for crossing areas of calm, the use of weight-saving and weight-savings ingredients and remote control of sails from the console on the bridge.

But his ship, like most of the legendary Flying-P liners, is rigged in the traditional manner as a so-called bark. "When it sails by Blankenese on the Elbe," Schoenfeldt says, "no ferryman will notice that it is not a Laeisz sailship."

Ferryman Schoenfeldt, who once learned his trade on the four-masted bark "Padua," is thinking of something beyond this: "Because a ship like this would be unique" there would certainly be enough people wanting to travel as passengers for a great deal of money, and this could help to meet the cost of the crew's wages.

The technicians and inventors have not been able to prove together whether the calculation works out in practice.

There are already a few freighters sailing the seas, using the wind as an auxiliary force to support engine propulsion. For example, the 700-ton Japanese motor tanker "Shin Aitoku Maru," which carries on its deck two rigid aerodynamic sails which can be folded up when not in use or when the wind is too strong, and which are rotated into the best position for each situation by a computer. However, of the approximately 40-percent energy savings which the tanker achieves in comparison with a traditional ship of about the same size, only 5 percent come from the wind as an auxiliary source of power. The rest was achieved through other refinements in ship construction.

Or the Greek coastal motor ship "Mini-Lace," which has been operating since last year with an electronically controlled auxillilary sail on a freestanding mast on the bow and helps to save energy costs for the shipowner.

But no shipowners are taking on the risk of putting a genuine "wind ship" in service --with an auxiliary engine for emergencies and maneuvering in harbor--as a freighter, and even the German shipowners, according to the Association of German Shipowners, are adopting a "fairly wait-and-see attitude" to similar projects.

It could happen that this will change with additional increases in oil prices. In many areas of shipping, for example in bulk freight tr: sport, average speeds will probably have to be reduced, and--according to Peter Schenzle, engineer at the Hamburg Experimental Institute of Shipbuilding and project head of "Indosail"-- "they will approach those which can be achieved with sails, applying today's aerodynamic findings."

"Indosail" is no racehorse either. Based on the average prevailing wind force of 3 in its area of operation, the 2,000-ton prototype will reach an average speed of 6 knots--1 knot more than a traditionally rigged ship of a similar size, for example, the bark "Gorch Fock," the school ship for the Bundesmarine, would achieve under the same wind conditions.

But unlike transoceanic trade between fast ports, in which freighters can be handled within hours after long trips, sail-powered freighters in the Indonesian island trade are already competitive today with average speeds like this. The distances between the many anchorages in Indonesia are short, but by comparison the layover times in the harbors, which are usually only equipped with cranes, are relatively long.

And then it is not worth mentioning if a sailship ties up a few hours later because of an unexpected calm.

9581
CSO: 3102/391

PEUGEOT, RENAULT CONTINUE AUTOMATION IN MANUFACTURING

Paris INDUSTRIES & TECHNIQUES in French 10 Jun 82 p 14

[Article by Alain Perez]

[Text] Welding, painting, and loading will soon be fully robotized; the next step: assembly.

Six-axis robots at Peugeot, flexible shop at Renault: the French automakers are placing all their bets on the automation card. Since 1978, PSA has discreetly been building itself an impressive robotized production facility. At Sochaux, some thirty hydraulic six-axis Unimates with capacities of 15-40 kg are in service on two parallel welding lines. They work on the assembly of 305- and 505-model bodies. Breakdowns occur less than 10 percent of the time, of which only 1 percent is attributable to the robots. This is fundamentally due to the welding heads.

1.10 Minutes Per Body

These robots are designed to spot weld eight different models. Four programs are presently used (305, 505 sedans, station wagon, and the United States version). The bodies are identified by a photoelectric cell at the head of the line, which detects the length of the frame. Each robot performs between 300 and 350 spot welds. The average time per body is 1.10 minutes.

About 50 six-axis, 80 kg robots (800,000 francs each) have just been ordered from Acma Cribier, a Renault subsidiary. They should be delivered before the end of the year. For 90 percent of the time they will also be used for welding tasks, a function which thus should be fully automated in two to three years.

According to the company's forecasts, in five years the Peugeot inventory will include 250 six-axis robots, compared to 140 at the end of 1982 (including the 50 Acma). Sequential or programmable manipulators will remain stable: 6500 compared to 6000 at present. The latter will be essentially used for loading and unloading machines, and especially presses. Multi-task robots are the rule in foundries, and there again, six-axis machines are necessary. They perform seven sequential operations in the fabrication of gear box cases: extraction from the press, mechanical control, water bath cooling, breakage of molding runners, emptying the water trapped during turnaround, and removal. Here again, hydraulic Unimates are

doing the work. Production increase is of the order of 10 percent over the manual approach: 1092 parts per day compared to 942. On the other hand, breakdowns are more frequent in the automatic mode: 16 percent compared to 10 percent. Apparently man stands up to heat better than the robot, a performance which he would probably willingly give up.

The learning-mode six-axis machines are essential for welding (complex paths), but the situation is less clear for body protection operations. At the Mulhouse plant, two five-axis electric Trallfa robots have been in service since three months. They are used to spray undercoating in the 104-model wheel wells. For painting, however, the company uses simple sweep robots (two orthogonal translations) manufactured by Ransburg. A six-axis AIOP is being tested for this application, but according to Peugeot specialists, five axes are sufficient.

Because of all this automation, the stock of bodies has changed from 20 days to five. The goal is to limit all that is not "net work," which means transportation, storage, and mounting on machines.

How far can we go? The answer comes from Mr Malcuit, director of production at Automobiles Peugeot: "For us, the only impediment to automation is our investment capability." In other words, if the means were available, all welding operations and all handling would be automation. That is, until final assembly, where the technology has not yet been fully perfected. The ideal is the famous Japanese concept, "zero breakdown, zero defects, zero stock." It remains to be seen if this will occur through "zero personnel."

At Renault Vehicules Industriels, the flexible shop of Boutheon is humming. There is no question that Regie Renault achieved a true technical victory, practically on schedule (several months of delay). In this highly automated shop (parts transfer, programmed machining), only the loading and clamping of rough parts, as well as turn around, are manual. A central computer makes a decision every 18 seconds. It controls the operation of the whole, and establishes priorities depending on circumstances. The task is to manage in real time a considerable number of events (3-4 per second). Any change in status (free machine, start or stop of one of eight wire-guided carriages, crossing conflict) is considered as an event. In practice, the number of families of parts to be fabricated during the day is decided in the morning at the beginning of the shift. The shop is self-regulating, which brings us closer to the "zero" concept. The inter-operation stock is null by definition, possible breakdowns are taken into account by the program, and quality is controlled partly on the machines and by sampling. As for personnel, it is reduced to five-man teams for a production of 100 assemblies per day (currently on the order of 30), or 300 parts.

The only open question is the profitability of the whole. The utilization index of the machines is multiplied by a factor which is still rather mysterious. The shop costs on the order of 45 million francs, plus study expenses which are at least as much of a mystery. There is no doubt about it: automation is becoming an industrial reality, and each one has his own way of counting.

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CSO: 3102/409

NC PROCESSING CENTER FOR SANDWICH-CONSTRUCTION AIRBUS PARTS

Munich-Ottobrunn MBB AKTUELL in German May 82 p 1

> [Text] They are taller than a man, as light as a feather and yet so rigid that fire extinguishers and complete toilet cabinets can be attached to them: The sandwich-construction dividing wall in the interior fittings of the Airbus. MBB [Messerschmitt-Boelkow-Blohm] in Hamburg will be able to react much more flexibly to customers' wishes in the future when finishing the interior and still save about three-quarters of the man-hours required previously. This will be made possible by a new processing center for sandwich sheets which Fittings Technology and Manufacturing recently opened in the Hamburg factory.

The sandwich sheet is one of the most basic design elements in the manfacture of aircraft interior fittings. A "sandwich" consists of two outer layers with fiberglass reinforced plastic which enclose a paper honeycomb of a particular rigidity. These elements are used, for example, as dividing walls in the on-board toilets, in cargo holds or as facings in the cockpit. Since each of the more than 40 airline customers of Airbus Industrie receives individual interior fittings that match its image, the sandwich parts used are also customer-dependent to a large degree. They differ not only in the pattern pressed into them but also in their shape.

There is an additional important aspect for the plastics workshop in Hamburg to consider: Depending on the airline, up to 150 drilled holes per component are needed for the sandwich walls, which differ each time in number and position. After drilling, inserts (different threaded plugs for supports) are put in the holes. Previously these operations could only be carried out using a large number of complicated and relatively clumsy templates. Each one of these templates had an average of 20 variations, from which the required combination had to be selected.

These assignments can now be carried out more flexibly, more safely and about four times faster with the aid of an NC-controlled processing center. The machine's job is to drill blind holes and through holes in sandwich sheets and then put the threaded inserts into the holes and glue them automatically. It is also suitable for contour shaping of components made of fiberglass reinforced plastic.

The most important advantages of the new processing center are:

--Fittings technology can react flexibly to requirements in Airbus interior fittings that are set at short notice and carry out customers' wishes.

--Man-hours for manufacturing per aircraft is reduced to one-quarter of the amount, compared with the time spent previously.

--Accuracy can be increased at the same time and consistent quality can be guaranteed.

--Bulky and heavy drilling equipment is largely dispensed with. This allows the area that was previously used for storing templates to be used directly for manufacturing.

The processing center itself is a special development, which was designed and built (with partial support from the BMFT [Ministry for Research and Technology]) specially for the complicated assignments in the assembly of Airbus interior fittings. The dimensions of the machine, including the control panel, are 7 ms by 3.6 ms. The holding surface of the machine table measures 2,200 mm by 2,400 mm. It is equipped with several vacuum locating fixtures which are automatically pressure-activated as each piece is laid on them and holds them securely at a pressure of 0.7 bar. The NC sheet drilling machine puts the threaded inserts into the blind holes after drilling and, through a filling station, also automatically squeezes the precise amount of adhesive into the adhesive holes of the inserts. The inserts are kept in magazines and can be summoned according to type. The processing center can be controlled by manual input or by punched tape.

9581
CSO: 3102/401

BRIEFS

TRANSRAPID SUSPENSION DEVICE TESTED--At the end of March a significant milestone in the current magnetic rail program was reached at MBB [Messerschmitt-Boelkow-Blohm]: the first fully equipped suspension truck for the Transrapid 06 achieved "magnetic" levitation for the first time without any problems on the MBB test stand in Garching. MBB, which is directing the project, is responsible within the Transrapid magnetic rail consortium not only for project management but also for important system components like the transportation and guidance system. The vehicle, which is now under construction at Krauss-Maffei, will be equipped during the course of the year with a total of eight suspension trucks, which have been fitted and pretested at MBB. The start of operation for the Transrapid test facility in Emsland is scheduled for 1983. [Text] [Munich-Ottobrunn MBB AKTUELL in German May 82 p 1] 9581

CSO: 3102/401

END

JPRS 81734

9 September 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 119

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JPRS 81734

9 September 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

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PHOTOVOLTAIC RESEARCH: PROGRESS IN THIN FILM TECHNOLOGY

Paris L'USINE NOUVELLE in French 10 June 82 pp 174-175

[Article by Claude Amalric "Photovoltaic Research: Progress in Thin Film Technology"]

[Text] There were few earth-shaking papers this year at the fourth colloquium on photovoltaic solar energy, but many improved processes, particularly in ingots, strips and thin film. The equipment and poster exhibit confirmed that. A noticeable absence: that of the Americans.

More than ever Georges Kamarinos went to the annual colloquium on photovoltaic technology to see colleagues. For this Grenoble scientist, "the era of big ideas has come to an end. What we have here is only technology," he says regretfully, without disputing its utility. It was from an appropriate technology that the Mitsubishi team (the first ones to do it) drew amorphous silicon from the laboratory. In the exhibit, in connection with the colloquium reserved for "posters," shock results had the visitors dreaming. While the main problem of thin film cells is to reach a surface in excess of 1 cm^2 without loss of efficiency--and without a short circuit--the Japanese indicate a 5.4 percent efficiency obtained with a 10 x 10 cm amorphous silicon cell. A panel which was removed quickly even described a cell of this type with dimensions of 20 x 20 cm. In order to understand the importance of these figures, one must go on to the next poster where Siemens announces 5 percent, but over approximately 6.5 cm^2!

In the search for the largest deposit of amorphous silicon (a-Sil) without a short circuit, it is Cambridge University that holds the record, with a 60 cm disk that is homogeneous to within 5 percent.

The other recognized thin film approach is cadmium sulfide on copper (CdS/Cu2S). There are no triumphs here: the migration of the copper in the CdS makes these cells unstable in the long run, to the point that the beautiful Solar Energy System factory built to produce such cells for the American residential sector has ceased its activity. In addition, the manufacturing efficiency is low: fewer than 50 percent of the cells made are good. A bleak picture. However, that fact did not deter Saint-Gobain Recherches which, since the first of the year, has been in the process of acquiring the technology perfected at Montpellier University by Michel Savelli for the thin film deposit of CdS cells. "It

is a natural step on the part of glass makers who master practically all of the techniques required: the deposit of large surface thin films on glass (tinted windows), encapsulation (double panes)... and the price of glass which only they are able to evaluate." Even before CdS becomes a reliable method, it is possible to estimate the cost of such cells to within 20 percent. The estimation made shows the solar watt at less than one dollar in 1986...if the method succeeds in solving its problems. It should be noted that Saint-Gobain is now under the French government, as is Photon Power (by CFP-Total [French Petroleum Company]), the other "pole" of CdS. Under such conditions, wouldn't it be preferable to advocate on behalf of the taxpayers the pooling of the know-how of these two laboratories, in competition until now, in order to give CdS a chance to succeed before the investors give up?

All the more because solutions seem to exist for the instability and the difficulties of manufacturing CdS cells. The proof of it is the Nukem company, in Hanau (West Germany), which had an exhibit at Stresa. According to Hans Bogensberger, physicist and director of the programs of the firm, CdS cells perfected by Stuttgart University showed no measurable deterioration over three years of exposure, with a conversion efficiency of between 4.5 and 7 percent. So that a 150 kW/year pilot unit is being constructed. "We are thinking about starting production at the end of this year, with the goal of going below DM 20 per watt at first. But after one or two years, we hope to make 600 kW to 1MW per year. Then, the price per watt would fall to DM 3 to 5..." 10 francs a watt? That would be ten to fifteen times less than what can be bought in France at the present time.

Jean-Pierre Dumas, director of the materials division of the CGE [General Electricity Company] laboratories, is hardly impressed by that. "Today the hierarchy of methods is: ingots, strips, thin films. But of course an unforeseen event can change everything. But that is not yet the case." The ingot is silicon cooled slowly in a square crucible. Its advantages over "drawn" silicum are: less loss of material and an easy realization of square cells reducing the surface of a panel for a given power. At the exhibit, at the stand of Photowatt, a subsidiary of CGE, a square ingot 20 cm on a side was ensconced on a pedestal. "Industrialization planned around 1983-1984," commented Jean-Pierre Dumas.

Drawn in a monocrystal or cooled in a polycrystalline ingot, silicon must still be sawed into slices approximately 0.5 mm thick. Since the kerf is as broad as the slice is thick, half of the silicon is thrown out at the end of its preparation where its cost is maximal. In order to avoid the constraint and the loss due to sawing, other methods have been devised. One of the most promising consists of producing silicon in a strip. At the Philips laboratory in France (LEP [Electronics and Applied Physics Laboratory]), a strip of graphite was drawn from a crucible containing molten silicon. Adopted since then by CGE, this technique progressed greatly at the end of 1981. By burning the graphite in oxygen at 1000°C, it was possible to obtain two strips of silicon with a single drawing. In addition, the solar cells are easier to manufacture after that. "Accounting for the work that remains to be done on this product, its industrialization cannot be foreseen prior to 1985," says Jean-Pierre Dumas.

Another pole of French research in photovoltaic technology is being created at Valbonne. A team directed by Claude Verie of the CNRS [National Center for Scientific Research] will study "rainbow" cells, that is, cells sensitive to the entire solar spectrum. In fact it involves several cells grouped together with each one being specialized by its materials and doping materials for a spectral band. A conversion efficiency of 40 percent is possible perhaps about 1986. These monocrystalline cells are for light concentration systems (500 to 1000 suns). The second project for this laboratory is to make cells of tinned amorphous silicon (doped with tin) which could reach 12 percent efficiency over 1 cm^2. (Until now, three laboratories have reached 8 percent with amorphous silicon: SERI [Solar Energy Research Institute], RCA and Mitsubishi.)

The speeches practically repeated the results shown on the posters. With a large void: this year there were almost no American speakers. One of the principal [speakers] who had been planned apparently was forbidden to make his trip to Stresa. "Now that their budget has been greatly reduced, they are falling back on themselves," observes Georges Kamarinos. "In addition, one notices that they never told us everything. For example, look at the results that they are revealing now on the efficiency obtained with thin film other than CdS or silicon: up to 12 percent in 1977, while everyone was getting a few percent with such films."

For this scientist and his colleagues present at Stresa it is clear that nothing has been said in photovoltaic technology. That will be the case until a method exceeds 10 percent efficiency with a very low manufacturing cost and mass production. Today many believe that the thin films will be the first to reach that point.

9969
CSO: 3102/389

LARGE-SCALE DUTCH WIND ENERGY PROJECT RECEIVES FIRST FUNDS

West Berlin DER TAGESSPIEGEL in German 17 Jul 82 p 10

[Article by Marion Kern: "Wind Energy Stored in the Sea"]

[Text] Dutch Minister of Economics Terlouw recently made available about DM 30 million for realizing the first stage of his country's ambitious wind energy program. The traditional land of windmills has begun to massively support a "renaissance" of wind energy in order to possibly cover about 8 percent of its electrical demand with the aid of modern windmills by the year 2000. At the focal point of Dutch considerations is "WESP" the "Wind Energy and Electricity Storage Basin Project." WESP will not only take advantage of the wind abundance along the long Dutch coast but will also use the ocean to mitigate the capricious disadvantage that the wind does not always blow hardest when the demand for electricity is greatest.

About 3 years ago the Dutch scientist L. W. Lievense submitted a report to the Ministry of Research in which he proposed the coupling of wind generators with a pump storage system. In response, the ministry commissioned a study group which concretized the plan in WESP. Operation is synchronized with the daily and weekly curves for electrical demand. The electricity supplied by the wind generators will be used to cover daylight peak demand on week days. At night and on weekends, the wind generated electricity will drive pumps which fill a storage basin with water. If the wind offering is not sufficient for peak demand times, then the electrical deficiency will be met with the aid of water power.

Now, of course, there is no high ground along the wind-rich Dutch coast which can be used for the pump storage system; therefore, Lievense proposed building the storage system in the ocean. For this purpose a large area in the Marker Sea--a portion of the Ijssel Sea--will be enclosed with high dikes following conventional concepts. When such a basin is filled, its water surface lies appreciably above that of the surrounding open sea. Turbogenerators are built into the foundation of the dikes, and these are driven by water flowing back to sea level when the gates are opened. When filling the basin, the turbogenerators function as electrical pumps.

The storage basin in the sea thus assumes a buffer function between wind offering and energy demand. If a calm prevails over a long period, then, of

course, nighttime electricity from conventional power plants must be used to refill the basin to its minimum level. This serves to assure peak-demand supply.

The wind generators themselves do not have to be located close to the basin since the electricity they generate can be injected into the normal electrical network from which the necessary electricity for filling the basin is extracted during periods of surplus. The power of each wind generator--plans provide for 1,000 units--will be 3 MW.

The realization proposals provide for the successive construction of 3 stages, each with a capacity of 1,000 MW of wind power and 800 MW of water power. The final capacity of WESP would then be 2,400 MW with an annual energy output of approximately 8,000 GWh. This would correspond to about 8 percent of the projected electrical demand of the Netherlands in the year 2000.

In spite of significantly higher investment costs in comparison to conventional power plants, WESP would be amortized after just 5 years according to project-group calculations. The annual savings in petroleum is placed at 500 to 800 million dollars. The first two stages--per project-group recommendation--should be ready for operation at the earliest possible time between 1990 and 1995.

In the first stage of the wind-energy research program, a 1-MW wind generator will now be built as a prototype. The program also includes studies concerning the effects of wind-energy use on the environment as well as studies relating to economic, planning and administrative aspects. Also to be determined is the performance of a group of modern windmills in combination with the electrical network. And, last but not least, the program is expected to determine the maximum percentage of Dutch electrical energy requirements that can be provided by wind energy.

9160
CSO: 3102/402

BRIEFS

COD LIVER OIL FUEL--In the land of cod liver they have found a new use for cod liver oil. An Icelandic experiment using cod liver oil instead of diesel oil in trucks has yielded very good results. The "Lysi HF" company in Reykjavik has been using cod liver oil in two of its trucks since last summer. The experiment has shown that diesel engines burn cod liver oil just as well as diesel oil without any damage. With cod liver oil the engines produce lower exhaust emissions than with diesel oil and, in addition, cod liver oil is about 40 percent cheaper than diesel oil in Iceland. [Text] [Helsinki HUFVUDSTADSBLADET in Swedish 25 Aug 82 p 1]

ONE-MEGAWATT PHOTOVOLTAIC POWER PLANT--The world's biggest power plant for photovoltaic production of 1 megawatt of electrical energy, the "Delphos" project, will be built in Puglia, in the Manfredonia zone. The power plant will be built for the ENEL [National Electric Power Agency] and the ENEA [European Nuclear Energy Agency] by a consortium expressly set up in Genoa for the purpose by AGIP [National Italian Oil Co]-Nucleare and Ansaldo. This was announced by the president of AGIP-Nucleare, Dr Giuseppe Sfligiotti, speaking in the Ligurian capital at the Fifth International Congress on Solar Energy and Other Renewable Sources. The consortium will enable the two companies to manage in a rational and programmed manner the construction of this installation that will be capable of transforming sunlight into electricity sufficient for a community of more than 1,000 persons. The value of the order is more than Lit 25 billion, and it is planned for the power plant to go into service in 1985; but since it is a modular installation, it will be possible for electricity to be produced and put into the distribution grid in the first months of that year. For building this sophisticated installation, AGIP-Nucleare will use the know-how acquired by its controlled company Pragma SpA, which has developed particularly sophisticated technologies, partly through the collaboration it has undertaken with some of the leading producers of photovoltaic materiel, such as the American companies Semix, Intersemix and Solarex. [Text] [Rome RASSEGNA PETROLIFERA in Italian 18 Jun 82 p 556] 11267

CSO: 3102/382

FOKKER'S POSITION IN AVIATION COMMUNITY ANALYZED

Paris AVIATION MAGAZINE INTERNATIONAL in French 15-30 Apr 82 pp 42-43

[Article: "A New Strategy for Fokker"]

[Text] Amsterdam--Although it holds close to half the capital shares of SABCA [Belgian Aeronautical Construction Corporation], Fokker is not playing an active role on the Belgian front. Their ties might perhaps have taken on new dimensions if the MDF-100 150-passenger airliner project had materialized, since SABCA was actively involved with it. Other opportunities to strengthen relations between the two firms will therefore have to be awaited. All of which meanwhile is not altering the very good relations between Belgium and the Netherlands.

There was certainly no basis for thinking that the abandonment of the MDF-100 would be a hard blow to the Dutch builder: Its highly diversified activities, which are well distributed between the civil and military sectors, still enable it to view the medium-term future with undisturbed serenity. With 9,500 employees on its payroll and an annual turnover that has now passed the 1-billion-florin mark, a substantial financial balance that will be confirmed by the figures for its 1981 operations, and a distinctive image that conveys an abundant sense of dynamism, it can afford to take the time needed for reflection and to prepare a new strategy for the future, that is, other choices.

The Hague authorities are clearly continuing to rely upon the Schiphol management teams. This means that the considerable support given to the MDF-100 could, at the right moment, be shifted to another sufficiently promising future project. The question is in what direction it will choose to go, having apparently decided to discard the 150-passenger alternative, at least at the level envisioned with McDonnell-Douglas.

Will we find Fokker taking part in the A-320 program in the event the latter is launched? The hypothesis is not to be ruled out, although it would seem to be just a bit premature. On the other hand, from a theoretical standpoint, it would appear reasonable to state that the Dutch firm would willingly take a 10 to 15 percent share of the new civil program, whose technical and commercial credibility are assured.

This possibility will clearly be considered within the terms of reference of a strategy for the future, on which the company's experts are presently at work. Little can be said in this regard at this point except that we must continue to await patiently the outcome of their studies. But ideas are not lacking, whether it be a choice of following up, in time, on the F-27 (the F-XX concept) or an in-depth study of a niche in the marketplace that has been little talked about for many years, namely, that for a new-generation 100-passenger module.

The Virtues of Patience

The ability to be patient is currently Fokker's strongest card. The only thing that is being delayed is expansion (the MDF-100 would not have succeeded another program but would have been added to the gamut of its current activities) and, for the immediate future, Fokker's stability is well assured: By the F-16 from the military standpoint and the F-27 and F-28 from the civil one, to say nothing of Fokker's participation in the Airbus 300 and 310 programs as well as the Short SD-330 and -360 ones.

Because of its larger size than that of the two Belgian aircraft manufacturers, Fokker is not in a position of dependence upon the compensation contracts that are tied to the General Dynamics F-16 multinational program. This program represents hardly more than 20 percent of Fokker's total annual turnover and some 1,200 jobs. The 100th American fighter plane assembled at Schiphol will be delivered during the month of June, a chronological checkpoint confirming that that the original schedule is being met.

Furthermore, continuity is assured. Now awaiting the completion of its commitment to produce 106 planes, announced nearly 7 years ago, is the recent decision of the Dutch Air Force to replace its Northrop NF-5's with the same type of plane. Fokker has moreover committed itself to produce the planes needed to cover attrition, which were not included in the original order, bringing the total up to 111 additional planes (40 of which are already on firm order). To these must now be added the planes to be delivered to Norway.

Every month, two F-16's leave the Schiphol assembly line. Added to these are the fuselages destined in part for the Gosselies and Fort Worth assembly lines and hence being produced at a higher rate of output: The 500th subassembly will be delivered in a few weeks. And lastly, production increases are in prospect, based on F-16 sales to third countries, further brightening the outlook for continuity and stability.

Fokker nevertheless fully intends to maintain its position as a builder of civil aircraft and, what is more, its status as prime contractor. A position that is in no danger whatever of being challenged in the immediate future, since the F-27 and F-28 are pursuing imperturbably their careers, despite the uncertainties of the current situation on the one hand, and despite the assaults of the competition on the other.

Soon, 750 F-27's...

The F-27 "Friendship" is being produced at the average rate of two units per month and the orders now total 739 units for not less than 160 users. Even though the American market is marking time, as compared to projections prior to the debacle that has overtaken many regional airlines, Fokker's prospects of continuity remain intact.

While the Dutch firm declines at this time to reveal publicly its intentions, it appears certain that the F-27 must sooner or later undergo a rejuvenation treatment, particularly by way of a retrofit based on the use of new propellers. Talks are already under way with this in mind, with Pratt and Whitney, General Electric and Rolls-Royce, as well as with Hamilton Standard and Dowty Rotol.

Although the twin-jet F-28 "Fellowship" is having to accept a slower pace (188 units sold to date), it too is holding its head well above water. Its production rate remains limited to one and one-half planes per month, but here again the medium-term outlook is one of optimism. Moreover, additional potential markets have appeared on the scene, in the form, for example, of a project for a "navalized" military variant that may be of interest to the United States Navy.

The tack to be taken by the European competition and the Canadian one, which is visibly showing its long teeth, remains to be seen. The F-27 is confronted, of course, by the de Havilland line and will be confronted also by the Franco-Italian ATR-42, while the F-28 will now be coming up against the British Aerospace 146. At Schiphol--without, for that matter, underestimating the attraction of its programs--no effort is being spared to develop a marketing expertise based on the experience gained over the years throughout the world. But it is nonetheless certain that the battle Fokker finds itself fighting will become much more fierce.

It is with all the more interest, therefore, that the emergence of Fokker from its silence to announce its new strategy is being awaited--a strategy that, in large measure and by way of new objectives, will condition the long-term future of the enterprise. For the moment, however, the prevailing mode at Schiphol is serenity.

9399
CSO: 3102/380

DORNIER'S NEW-GENERATION AIRCRAFT: DORNIER 228-100

Project Review

Stuttgart FLUG REVUE in German Aug 82 pp 70, 72

> [Text] In its Neuaubingen factory, Dornier GmbH of Friedrichshafen is gradually converting to a generation of aircraft with excellent sales prospects. Those selling the newest German commuter and utility aircraft, the Do 228, anticipate a worldwide success.

The FRG is regarded as a country with one of the highest standards of living. In order to be able to remain competitive worldwide in spite of this, high-value products and technologies are needed. This is particularly true in the aerospace industry.

Unlike military purchase programs, which are measured by more munificent standards, civilian programs start from a much more difficult basis. The firm of Dornier GmbH, with about 8,500 employes in factories on the Bodensee and in Munich, is converting to the newly developed Do 228 commuter and utility airplane family, following the reduction in the pace of the Alpha jet manufacturing program.

The only large company in the industry in the FRG with private capital, which earned sales worth DM 1,011 million in the business year 1980, with a surplus of DM 27 million, found itself a long time ago faced with the difficult task of keeping jobs and of maintaining its good earnings.

New market studies provided interesting information about the greater need for commuter and utility airplanes in the future. Utility airplanes like the Do 28 D-2 Skyservant have been built for years in the Neuaubingen factory. The fuselage in this airplane proved to be particularly robust.

In 1981 The Do 228-100 Received Type Approval

A research program supported by the Ministry for Research and Technology (BMFT) made it possible to develop a completely new wing using significant manufacturing methods, designed expressly for highly cost-effective production. The experimental version, based on a modified Do 28 D-2, was given the new TNT (New Technology Wing) wing, with two Garrett AiResearch TPE 331-5-252 D turboprop engines. The first

flight took place in the summer of 1979. The results were so astonishing that the company directors immediately decided to develop the models known today by the designations 228-100, with 15 seats, and Do 228-200, with 19 seats.

The Do 228-100 was given type approval in December 1981 by the Federal Aviation Office (LBA). Certification of the 200 version will be completed shortly. Almost 100 aircraft, including 27 definite orders, fill the order books of the south German family company. The first airplanes have already been delivered to customers.

Small regional airlines, which see their principle function in providing connector services to larger airports, have shown the greatest interest in this type of aircraft.

Dornier lists the following typical applications:
--Passenger transport
--Passenger and freight transportation
--Business flights
--Ambulance work
--Photogrammetry
--Geopnysical applications
--Industrial connecting flights
--Marine patrols
--Search and rescue service
--Training

The company is benefitting from its experience in previous years. The fuselage is based on that of the Do 28 D-2, with a newly developed three-point nose-wheel landing gear.

There were problems in the design of the landing gear. According to Dornier, five different landing gear manufacturers were unable to develop a special landing gear for the 228 in an extremely short time. Dornier engineers solved the problem themselves.

The wing itself is constructed in a special manufacturing process (see also FLUG REVUE 12/1981). Blocks of aluminum form the basis of this new process. In the production shops in Neuaubingen, as though controlled by a ghostly hand, the longitudinally and transversely ribbed panels are formed on NC-controlled milling machines and, following thorough checks and finishing operations, are assembled into complete wing boxes. This modern manufacturing method reduces total production costs by 30 percent.

Riveted joints, which are highly time-consuming, are dispensed with, and the upper wing surface is more homogenous and closer to a true profile in the area of the main box, which, besides the many other advantages of the newly designed wing, results in a 30-percent saving in fuel, increased range, improved climbing performance and higher speed.

Both versions have the same engines as the TNT experimental aircraft. A four-bladed Hartzell propeller was chosen for the Garrett turbine from eight different propeller types.

With its modular principle, Dornier has created an entire family of airplanes, which will guarantee full employment of existing manufacturing capacity for years to come. Further system-oriented developments will permit the development of new types in this category, which can be tailored to suit the market, at low additional cost. The biggest handicap of the present family of airplanes is the fact that the fuselage does not have a pressurized cabin.

Comparable models, principally the newly developed commuter airplanes such as the British Aerospace Jetstream 31 and the Fairchild-Swearingen Metro III, have pressurized fuselages allowing higher operating altitudes.

Worldwide interest in the two versions, Do 228-100 and Do 228-200, proves that a German company can be competitive through superior technologies and technical know-how, in spite of clearcut competition.

Pilot Report

Stuttgart FLUG REVUE in German Aug 82 pp 72,75

[Article by Robert Rahn: "A Great Deal of Built-In Safety"]

[Text] The airplane is the first preproduction machine, serial number 7001, which was delivered to a Norwegian airline. The design received its certification in December 1981 for visual and instrumented flights in daylight and at night. Although complete de-icing equipment is installed, flights under known icing conditions are not permitted at the present time, because tests under icing conditions have still to be carried out.

Entry for the crew and passengers is through the left half of a double-door measuring 1.28 by 1.34 ms. The cabin is equipped with two rows of generously proportioned comfortable seats. The center aisle is 31 cms wide. Headroom dimensions are not given. In the rear part of the cabin and in the capacious nose section there are two large baggage areas with a substantial payload capacity. The many possibilities for loading require conscientious checking of weight and center of gravity.

A Spacious Cockpit

Access to the pilots' seats is somewhat restricted and requires a certain amount of dexterity, since it is necessary to climb over the rear part of the center console. The available space in the cockpit is good. The pilots' seats deserve great praise, their range of adjustability satisfies every wish.

The basic instrumentation, with radio and navigating equipment, is up to the customary standard for today. One must single out the way that all malfunctions have been grouped together in a single main warning cluster in the center of the instrument panel, with the upper row of panels containing the most important warnings shown in red, the remaining panels shown in yellow. The red warnings are also linked to a penetrating 1,000-Hz warning signal. The aircraft has a fire warning system for the engine bay, with two large warning indicators. An extinguishing system is offered only as an option.

The landing gear lever was positioned approximately over the right knee of the pilot, who sits on the left, where it was easy to operate. The hydraulic system has been kept simple and robust. A pump driven by an electric motor is the power source for the landing gear, brakes and nose-wheel steering. For emergencies there is a hand pump in the cockpit, with which the landing gear can be extended. In this event brakes and steering are no longer available. However, by reversing the thrust and modulating the power to the engines, the aircraft can still be braked and steered. The time to extend and retract the landing gear in normal operation is relatively long, 18 seconds for each. Emergency extension requires about 280 strokes of the pump and requires 8 long minutes.

Turbine and Propeller Form One Unit

The left half of the center of the instrument panel is taken up by the engine instrumentation. The instruments are circular, arranged vertically. Among them are the so-called "Beta" lights to indicate operation using thrust reversal and the engine limiter switches, which prevent the maximum permissible exhaust temperatures and torque levels from being exceeded--all in all a sensible arrangement.

In the Garrett engines that are used the turbine and the propeller are solidly coupled through gears. At maximum turbine rpm, the propeller reaches a speed of only 1,591 rpm, which results in a relatively low external noise level.

The power plant is equipped with a "Negative Torque and Sensing System," which means that in the event of engine failure the propeller blades are automatically kept in the area of least resistance. This substantially reduces dynamic force during the failure and makes the pilot's job of maintaining control much easier, particularly in the vertical axis.

Engine control is achieved through two levers for each, located on the central console, the throttle lever with provision for thrust reversal and the rpm lever with a setting for propeller feathering and provision for engine shutdown. The right half of the console offers sufficient space for additional equipment, for example, Omega and R-NAV [Random Navigation].

The aircraft can be trimmed in all axes. The electric indicators are located in front of the throttle levers. Unfortunately the controls are not arranged in a unified fashion. Stabilizer trim is operated electrically through a double safety switch on the control column horn, aileron trim is also operated electrically through another rocker switch on the console and the rudder is operated mechanically through a crank in the cockpit ceiling. A better layout for these control elements is being considered at the present time.

Starting the engines takes place automatically and can be carried out with the help of the on-board batteries. Visibility during taxiing is very good. The nose wheel is controlled through the rudder pedals, with the normal range of movement being $\pm 8°$. Through a microswitch on the control column horn the range can be expanded to $\pm 45°$.

For takeoff it is necessary to preset the elevator trim as a function of the center of gravity and aileron setting, in order to provide a properly adjusted progression of manual effort while turning. Takeoffs are possible with flap settings of 0°, 5° or 20°. Maintaining direction presents no problems, even in a strong crosswind, due to the steering and the good adhesion of the nose wheels. In a steep climb immediately afterwards, retracting the landing gear does not cause any change in momentum, but the flaps do create a strong, unpleasant change, which has to be compensated for by extensive changes in trim.

Depending on its weight, the airplane can reach rates of climb from 2,000 to 3,800 ft/min. Testing its flying characteristics revealed no other objections through the entire range. The rudders are well balanced, manual effort is relatively high, as befits its intended role as a transport aircraft.

Loss of lift is indicated in all configurations by medium shaking and the nose dropping. Rudder and ailerons always remain effective in the natural direction. There is not sufficient warning from natural aerodynamic buffeting so there is a device to give optical and acoustic warning 10 to 15 knots before loss of lift occurs. Stalling in single-engined flight, in accordance with FAR [Federal Aviation Regulations] 23, with 75-percent power in the remaining engine, revealed similarly good characteristics, without any tendency to unusual, uncontrollable attitudes.

Testing for the slowest speed while retaining controllability in single-engined flight showed a figure of V_{mc} = 80 KIAS [Knots Indicated Air Speed] under actual boundary conditions. This is good confirmation of the manual figure of V_{mc} = 81 KIAS. The high level of performance achieved by the wing design is particularly obvious in the single-engined performance levels. The rates of climb in single-engined flight at medium weights at sea level are 700 to 800 ft/min.

An examination of the manual conducted during the test revealed both qualitative, that is, confirmation of the speed of the best angle of climb and rates of climb (V_x, V_y), and quantitative good confirmation of the figures in the manual. The design is easily able to meet the supplementary requirements of FAR 23 covering engine failure during takeoff, even with the landing gear extended and the critical engine cut, since it can reach rates of climb of about 250 ft/min at maximum takeoff weight.

This means a high level of safety in the takeoff phase in particular, such as exists in large aircraft certified according to FAR 25.

Easy Approach With The Do 228-100

Normal cruising speeds are in the range between 170 and 220 KTAS [Knots True Air Speed], where the higher speeds very quickly border on the operating limit of V_{mo} = 200 KIAS, because of the operating altitudes imposed by the lack of a pressurized cabin. A limit about 20 to 30 knots higher would do greater justice to the performance potential of the airplane. Approach and landing are completely problem-free. With centers of gravity located in the middle, the nose wheel drops noticeably toward the ground after the main landing gear has touched down, making the design

extremely insensitive to crosswinds when combined with the steering. The noise level in the cockpit and the cabin is satisfactory, so that operation using speakers is possible, although basically headphones are preferable for radio contact.

9581
CSO: 3102/411

SIAI MARCHETTI PLANS 'CORMORANO' AMPHIBIAN AIRCRAFT

Rome AVIAZIONE in Italian May 82 pp 282-283

[Article by Marco d'Alessio: "The Cormorano after the Canguro"]

> [Text] SIAI Marchetti proposes a new twin-turboprop amphibian. Taking advantage of all the experience acquired with the Canguro, the Agusta-group firm proposes a machine for which a vast market could open up, especially abroad.

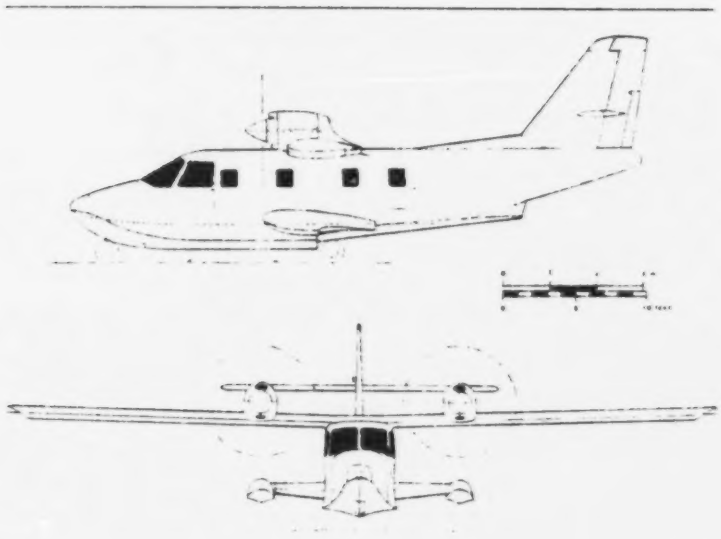
The mark that identifies the project is S-700, but in SIAI Marchetti circles they have already given it a more colorful name and one that fully fits the characteristics of this airplane which, once again, is born of an original project by engineer Frati: Cormorano. AVIAZIONE can offer, as a preview, a detailed examination of this new amphibious aircraft which, to judge by its characteristics, could have notable commercial success, also because of the variety of uses for which it is suited.

Let us look more closely at this Cormorano, then. As its name suggests to anyone who has at least a little familiarity with the world of birds (the cormorant is a bird that lives on lakes, rivers and the sea), the Cormorano is an amphibious aircraft derived directly from the SF-600 Canguro, the simple utility twin-turboprop that SIAI has already designed and that is undergoing flight tests. The philosophy adopted in the preliminary design phase for construction of the aircraft was to use as much as possible of the structural components and installations of the Canguro. This approach, chosen by the designers for obvious reasons of costs, will also, in our opinion, be beneficial to users of the aircraft who will be able to take advantage of commonality of parts, both in the case of a mixed fleet and in that of a fleet of just a few aircraft that are all amphibians. One consideration to note in this context has to do with the adaptability of Frati's original design, which, thanks to the linearity and simplicity of the solutions adopted, has lent itself to these changes very well.

One of the modifications necessary was the beefing-up of the wing, as necessitated by the increase in all-up weight due to the addition of particular elements that make the aircraft amphibious (float arms, hull). In this area, the SIAI designers have taken good advantage of the latest technological achievements, using new materials and construction technologies for building the hull.

Both the hull and the floats are made of composite materials, and this choice has made it possible not only to achieve an immediate saving but also to offer an aircraft that does not suffer from the problems of corrosion of the immersed part that are typical of use in a marine environment. At the same time, precisely by the use of these construction technologies, a better surface finish and a perfect seal were obtained. From the desire to give the aircraft maximum versatility arose the need to adopt a retractable landing gear, the same one that is offered as an option on the Canguro, which because of its strength enables the aircraft to operate without any problem from grassy fields or semiprepared surfaces, including ones of small size, as we shall see in the takeoff and landing performance characteristics.

The aircraft's aerodynamic elements have been partly revised so as to optimize their characteristics in this new use. In particular, the moving--or better, the flipping--of the engines to the upper side of the wing, to ensure a good distance from water spray, has also made it necessary to raise the horizontal tailplane in order for the surface to remain in the propeller wash from the two engines. The wing, which is high and of square plan, adopts a new profile of high relative thickness--GA (W) + 1--which, while ensuring a high coefficient of lift, does not increase aerodynamic resistance, does not affect structural lightness and makes it possible to have considerable space available for fuel. The wing does indeed contain four identical tanks with a total capacity of 1,100 liters of fuel, in addition to the 400 liters in the tank fitted into the central hull. The Cormorano takes advantage of the same constant-square-section fuselage that facilitates the loading operations and increases the aircraft's capacity to transport voluminous goods.

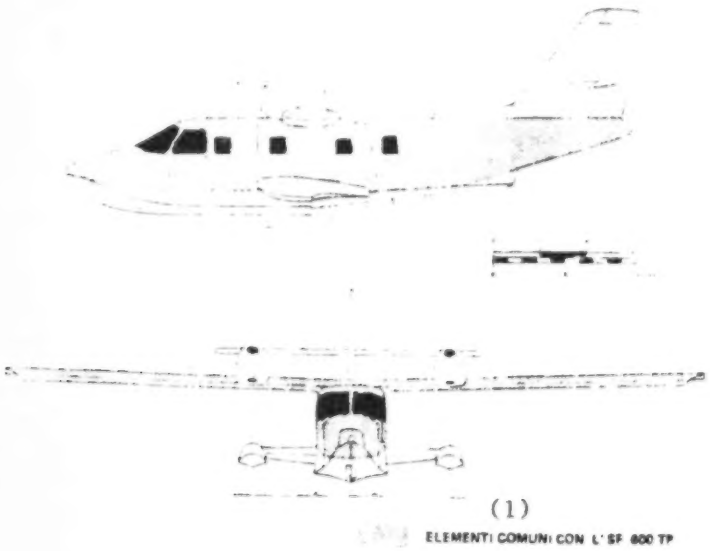


Two views of the S-700 Cormorano in the version with the AR-318's

The question of the aircraft's motorization is purposely being left open. The Canguro is presently powered by two Lycoming LTP 101's, and this solution could be adopted without problems for the new aircraft too, but the first Cormorano should be powered by the same Allison 250C-17 turboprops that are used by the SM-1019. Within SIAI, though, there are great hopes of being able to build a completely Italian aircraft, and therefore everyone's attention is directed toward the tests that will show how the Alfa Romeo AR-318 goes; an AR-318 is continuing to fly on a King Air in the experimental division. Apart from the nationalistic aspect as such, the Alfa Romeo solution for the Cormorano's engine would also be of considerable nationalistic importance, inasmuch as it could make it possible to overcome all the difficulties of third-country supply and sales that arise with foreign engines. With the two AR-318's that drive two reverse-equipped variable-pitch three-blade propellers, the Cormorano will weigh 2,250 kg empty and will have a maximum takeoff weight of 4,200 kg. Cruising speed at 10,000 feet has been calculated at 180 knots, and with maximum fuel load, the aircraft will have a range of 1,600 km.

We refer the reader to the table for the other technical characteristics, but it seems of interest to go into some detail about the missions for which the aircraft is proposed. In general, it can be said that the Cormorano is a good example of a utility aircraft whose amphibious capacity has increased its possibilities of use especially at sea or in zones in which water surfaces are present and in which the orography of the terrain or the lack of traffic make it inadvisable to build even small airports. In such cases, the Cormorano can

be used as a freight and passenger aircraft connecting isolated or touristic localities with major centers or with international airports. At sea, the Cormorano, with special equipment fitted, can do patrol, search and rescue work, integrating its action with that of rotary-wing craft, over which it has the advantage of lower purchase and operating costs and a more extensive radius of action. Also in the marine environment, another possible use for the aircraft is oil-platform support, even though in this task, proposed by SIAI, it seems to us that the limitations inherent in any fixed-wing aircraft cannot always be overcome even by the amphibious type.



In this drawing, the elements that are common with the SF-600TP are shaded.

Key: 1. Elements common with the SF-600TP

In any case, the characteristic of greatest interest for use of the Cormorano is the possibility of its carrying a module for use as a water-bomber. The module makes it possible to carry 1,300 liters of water and retardants and can be fitted in a few hours. The problem of vast areas subject to more or less "spontaneous" fires during the summer months is not typical of our country only; on the contrary, it is common to many nations. As in Italy, in other countries too the solution that seems most attractive is use of the so-called water-bombers or "fire bombers." The two types of aircraft differ in the liquid ejected (water in the former case, retardant liquids in the latter) and the typology of attack on the flames. While the water bombers work by discharging large quantities of water, preferably soft, directly onto the flames, the fire bomber releases chemical retardants ahead of the fire to keep it from propagating. It is difficult to establish which of the two types is better, especially because the conditions of use vary greatly from place to place, and with them, the output that the two types of craft can deliver. In any case, there is no doubt but that the Cormorano can validly take a place among anti-

S-700 Cormorano--Technical Characteristics

wingspread	15 m
length	12.15 m
height	3.6 m
wing area	24 m^2
engines	Alfa Romeo AR-318
power	2 X 580 shp
propellers	three-blade, variable-pitch and reversible
weight empty	2,250 kg
maximum takeoff weight	4,200 kg
12-seat cabin, 1 or 2 pilots	
useful cabin volume	7.9 m^3
cruising speed at 10,000 feet	180 kts
maximum climbing speed at sea level	1,400 ft/min
takeoff run: - on land	305 m
- on water	450 m
alighting run: - on land	320 m
- on water	300 m
operating ceiling	6,700 m
radius of action	1,600 km

fire aircraft and, thanks to its ability to take on water either conventionally or while floating on water, will be capable of doing considerable work both as a fire bomber and, where water surfaces are available, as a water bomber. According to calculations done by the SIAI technicians, with a water surface within a radius of 10-20 km, the Cormorano can discharge onto a fire, acting as a water bomber, 18.2 or 10.4 tons of water, respectively, every hour.

The amphibious-aircraft sector is very promising from the commercial point of view: the few existing aircraft are now reaching the end of their operational lives, while the market could be particularly interested especially in a simple and robust machine like the Cormorano, which in particular zones of the world such as South America, Africa, Southeast Asia, etc, would find its natural working environment.

11267
CSO: 3102/382

AIRBUS CONDUCTS FIRST STUDIES OF USE OF 'FFCC' A 300

Paris AVIATION MAGAZINE INTERNATIONAL in French 15-30 Apr 82 pp 49-51

[Article by Serge Brosselin, special correspondent at Djakarta: "A-300 FFCC--First Operational Evaluation on Garuda Airline Network"]

[Text] Less than 2 months after having delivered the first FFCC [Forward Facing Crew Cockpit] Airbus to the Garuda Indonesian Airline, officials of the European consortium have conducted an initial operational evaluation of the A-300 in its "all forward-facing" configuration. The evaluation is supplemented by a survey of the factors involved in the introduction of the new procedures.

Between 18 January, the date of receipt of its first A-300 B4, and 12 March, when it took delivery of the sixth of the nine planes it has ordered, the Garuda airline became the first in the world of Airbus Industrie's clients to have received as large a number of planes in as short a span of delivery times: The rate of deliveries actually averages out to one plane every 6 days. To be noted in passing is the fact that the most recently delivered A-300 (No. 159) is indeed the same one that was used for FFCC certification, thus providing an opportunity to draw upon the very first technical and operational data logged with the putting in service of the FFCC. Pierre Baud, assistant to Bernard Ziegler and an Airbus test pilot, first gave a number of details, at Toulouse, from the builder's viewpoint. Then, 4 days later, at Djakarta, Wiweko Supono, president of Garuda, for his part, summed up his first impressions and did not fail, in passing, to add some deeply felt mercurial comments with regard to all those who fail to convey exact and objective information to the public on the FFCC concept. Lastly, three Aeroformation pilot instructors, including Mr Pinet (head of the Toulouse training center), who had participated in the ferrying flight (one technical-inspection stop at Abu Dhabi and a second one at Bangkok), provided insights concerning the entire aspect of distribution of the workload aboard that are all the more priceless in that they are based upon experience gained throughout a period covering both the machine qualification of the Garuda crews and the so-called "line training" phase which immediately precedes the leaving of the pilots entirely on their own.

While he deems that the conclusions to be drawn from 1 month of operation cannot in themselves be considered significant (even though had some serious

mishaps occurred during that same period there are those who would probably have seen no point in questioning the validity of its time span), Pierre Baud nevertheless expressed full satisfaction with the manner in which the Indonesian crews have familiarized themselves with the A-300 FFCC. The only two technical problems that came up during that period were very rapidly resolved. One concerned the modifications it appeared had to be made to the automatic pilot system software; since then, the system has functioned with a very high degree of reliability in all the operational modes associated with its use. The other problem, which has also been resolved, concerned the disconnection of the automatic control lever and the digital automatic pilot, which was occurring at a speed of 100 Kt [knots] during takeoff; Hans Springer, manager of Airbus ground maintenance at Djakarta, told us this had occurred some 10 times. Lastly, to close the chapter on the few problems encountered, one engine had to be changed, an engine that for reasons unknown was not putting out its rated power (thus providing a thrust 7 to 8 percent below normal specifications); and in addition, several operational abnormalities were found in the OMEGA long-distance navigational system, with which the Indonesian airline had chosen to equip itself. It was stressed, however, that the latter did not represent a technological fault inherent in the system with which the Airbus has been equipped but is rather ascribable to external causes related to the operating principle of OMEGA (see AVIATION MAGAZINE INTERNATIONAL No. 811): Radio coverage of this zone of Southeast Asia cannot be fully provided until the station currently under construction on Australian territory is put into operation.

A Different Distribution of Workload

The rate of usage of the Airbuses on the Garuda network currently averages 7 hours 45 minutes of flight per plane per day, each plane completing an average of 28 round trips per week. But beyond the different findings with respect to the availability factor of the planes, it is very evidently all the observations reported with respect to the behavioral response of the crews to the FFCC and the manner in which they have adapted to it that have been, as they should be, the main center of attention. In this regard, the president of Garuda has expressed his satisfaction at the ease and speed with which the airline's pilots have familiarized themselves with the Airbus dual-pilot system. He said in substance: "The fact that a plane is dual-piloted does not necessarily imply any added risk of accident; those who continue to advocate three-man crews are ridiculous." The company's pilots, he added, have already acquired some experience with dual pilotage and have found that with the Airbus FFCC the workload appears to be even less than that on the DC-9's currently operating on the Garuda network (the Airbus, for example, has the automatic control lever).

Asked also about the possible modifications that Garuda may eventually want to make to its fleet of Airbuses, Wiweko Supono said that for purely financial reasons he does not envision, at least for the time being retrofitting the planes with color cathode tubes. Similarly, the head of Garuda made it clear that he is not considering at this time equipping the planes with Class III automatic landing gear.

All the different questions having to do with the implementation of the new procedures and with the changes in the distribution of the on-board workload brought about by the introduction of the FFCC were addressed by the team of Aeroformation personnel that has converted the Indonesian pilots to FFCC. The various instructor pilots we were given the opportunity to meet all confirmed the very high degree of competence shown by the Garuda pilots. "From the very start," one of them said to us, "we became aware that we were dealing with pilots gifted with very agile minds, so much so that there was a tendency to more or less unconsciously take over some of the work incumbent upon the other cockpit crew member to perform at the time. To be exact, this "excess efficiency" finally compelled us to suspend one phase in their progression so as to again "brief" the pilots on just what functions each one of them was expected to take on to himself." The fact is, according to Mr Pinet, the training of young pilots to pilot an FFCC plane presents absolutely no major difficulty, since the basic requirement involved is much more in the nature of openness of mind than one of experience acquired over a a long period of having piloted a three-man crewed plane.

The progressive stages set up for the training of the Garuda pilots by Aeroformation were as follows: 20 hours of "procedure" simulator, 28 hours of pilotage simulator to which are added 6 hours of actual flight, or a total of 54 hours of training for a crew of two pilots. In an FFCC cockpit--in view of the absence of a third crew member--it is agreed that the pilot who is not at the controls takes action to correct any malfunction. During the qualifying period at Toulouse, the two pilots were graded simultaneously; one of the instructors even said that a decision had been taken to be more severe in the grading of the pilot among the two crew members who was not piloting at the time.

Assuming a malfunction occurs, the procedures to be applied on the FFCC A-300 are grouped under two categories of intervention: The emergency checklist and the non-urgent checklist. In the first of these two categories (20 possible malfunctions are included), the number of actions to be performed for each sequence has been limited on average to three interventions. For these 20 cases of malfunction, the crew must imperatively apply a memorized checklist. For the so-called "non-urgent" procedures, on the other hand, the pilots are not required to memorize the checklist; the different actions to be taken one after the other to isolate the trouble are listed on cards showing four possible "arrangements": The number 1 placed alongside a specific action indicates that the said action is to be taken by the pilot at the controls; the number 2 indicates an action that is the responsibility of the other pilot who is at the moment not piloting the plane; groups CM1 and CM2 identify respectively the crew member seated on the left and the one seated on the right.

Another question that of course was very much addressed throughout our talks was: What influence does the FFCC cockpit have on the behavior of the crews, or, in other words, to what extent does it contribute to the conditioning of new reflexes? The response to this question centers on two aspects. First of all, as regards the workload aspect, the greater availability of the crew is put to advantage in exercising a more "analytical" surveillance of the functioning of

the systems. The overhead position of one of the instrument panels compels the crew to raise their eyes and to think out problems that have heretofore been solely the prerogative of the flight engineer and navigator. Secondly, it is pointed out, piloting of the FFCC has brought about a new awareness on the part of the crews; They have discovered that they are as capable as was the third man of the dealing with piloting parameters they were heretofore not permitted to address directly. We cite, by way of example, control of the different parameters involved in the starting up of the engines, the regulation of cabin temperatures, etc...

Lastly, it seemed very difficult to avoid addressing the fundamental question--dual pilotage or 3-man pilotage?--in terms of the operational safety of the FFCC. In this new version of the "battle of Hernani," it seems that the controversy that is pitting the older view against the more modern one is tilting little by little in favor of the latter. Extreme caution undeniably still warrants a detached view of events thus far, but on the other hand one cannot avoid adding two facts to the dossier. First of all, some pilots do not hesitate to state that--provided, of course, the reliability of the FFCC becomes established--it is much easier to divide the workload between two than among three. In the second place, the tests that have been carried out, on the simulator as well as on line, have shown that the simulated failure of one member of the crew has no effect whatever on the safety of the flight: The member who remains at the controls is fully capable of absorbing the additional workload resulting from the unavailability of his colleague.

Airbus Industrie and the different equipment manufacturers involved in the A-300 B4-FFCC program (SFENA [French Air-Navigation Equipment Company], Sperry, Smith Industrie, Jaeger, EAS [Europe Air Services],Intertechnique, Pratt and Whitney, SOGERMA [expansion unknown], etc) are assisting Garuda in everything concerning the maintenance of the planes currently operating in Indonesia. This presence, it was pointed out, is aimed at providing technical assistance and serving as consultants to the Indonesian technicians.

By early 1983, Garuda will have taken delivery of the A-300 FFCC flight simulator, which is to be installed at the Indonesian airline's PNT [expansion unknown] training center at Djakarta.

A-310: Flight Test Schedule

Some details concerning the A-310 flight test schedule were also provided by Pierre Baud at Toulouse on 11 March. According to Bernard Ziegler's assistant, the technical aspects of the plane are expected to be frozen by September.

The first three prototypes, two of which are to be equipped with Pratt and Whitney jets and the third with GE engines, will serve for the basic certification (coverage of the VOM [expansion unknown] domain).

Two other A-310's will undergo "temperature" test runs and "route proving" test runs. The five planes will make their maiden flights in April, May, August, December of this year, and February 1983, respectively.

Approximately 1 week is being devoted to ground tests. Extension of the flight domain is scheduled for this June.

To date, 13 airline companies have already ordered the A-310, the most recent one--Cyprus Airways--having decided to purchase two of these planes.

9399
CSO: 3102/378

COMMENTS ON LAUNCH STRATEGY FOR AIRBUS A 320

Paris AVIATION MAGAZINE INTERNATIONAL in French 15-30 Apr 82 p 14

[Article by Gordon Swanborough: "When Should A 320 Be Launched?"]

[Text] An observant visitor to Airbus Industrie in Toulouse today has no trouble noting that the intent of the European consortium is not solely to mark up a big score in the development of its A-300 and A-310 programs but also to proceed rapidly to the launching of a third member of the Airbus family: the A-320.

There can be no question that this plane will fill the needs of a goodly number of airline companies toward the end of the 1980's insofar as concerns the market for 150-passenger airliners. A market, let us recall, that has been estimated at 6,000 planes between now and the year 2000, one-third of which Airbus Industrie expects to capture.

Across the Channel, however, there are uncertainties as to whether the A-320 can be launched this year. Uncertainties not indicative of any reservations as to the design of the plane. Actually, uncertainties stemming in general from the current slump in the air transportation industry.

British Aerospace, which--as we have already pointed out--wants a substantial share in the new program, as a partner in Airbus Industrie, calls attention to the risk involved in taking too early a decision to launch production of the plane. The fact is that the enthusiasm on the part of one or two airline companies for the A-320 (Air France and Delta) must be weighed against the financial difficulties besetting many others.

And in all objectivity, there can be no doubt that the difficulties confronting numerous airlines must be perceived as dampers on the growth of air traffic. Difficulties that are entirely real for the shareholders who are receiving no dividends, for the employees who are losing their jobs, and for the financial institutions that are having to carry the bag (the air transportation industry's results having been so bad in 1980-1981--and they will probably be so again in 1982--it is certain to be some time before the confidence of the financiers and bankers will again be restored).

In short, the A-320 clearly could not be launched without a significant number of orders in hand. In Great Britain, however, the thinking is that even if a sufficient number of orders were to materialize in the near future (there is a real possibility that Delta may decide in favor of the 150-passenger plane within the next 6 months), a premature launching of the plane could be followed by a serious lack of orders, similar to the one experienced by Boeing with its 757.

The fact is that to be a significant economic success, the new plane will have to be produced at a sufficient rate to avoid negative repercussions on Airbus Industrie's financial resources and, hence, probably on the unit cost per plane. In other words: Looking down the pike and beyond a substantial number of immediate orders, there must be reasonable assurance that future clients will not be experiencing disastrous financial straits.

There are factors, of course, that must be taken into account by the Airbus Industrie partners. True, all things considered, the fact that the American builders have also not yet decided to launch a 150-passenger plane could mean that they feel they are unable to compete with the European consortium from the standpoint of timetables. On the other hand, however, if the Europeans wait until market conditions are ideal to launch their new plane, obviously this will give Boeing and McDonnell-Douglas more time to complete the study of their new planes and to become thus more competitive.

The path the Europeans must trod is therefore a very narrow one. Without forgetting, of course, the question of the engines. But that is another problem...

9399
CSO: 3102/378

ENGINE MANUFACTURERS VIE FOR OPPORTUNITY TO EQUIP A 320

Paris AVIATION MAGAZINE INTERNATIONAL in French 15 Aug 82 p 11

[Article by Roger Cabiac]

[Text] The evolution of the situation in which the airbus A-320 project finds itself will be, without any doubt, one of the principal themes of conversations both official and unofficial that will take place during the Farnborough air show. The recent acceptance in principle by Canada to participate in the construction of this new, twin-engined, short medium-range, 150-seat transport, the prospect of a reduction in shares for the airbus industrie partner firms in civil aircraft research and development, a certain clarification of the problem posed by the choice of the engine to be a part of the probject, surely will be reasons that will bring up the launching of the program, while taking into consideration the tenacious stagnation, even recession, in the civil aircraft market.

In order to proceed with technical plans, one of the major problems posed for the airframe designer is that of choosing the best possible engine which is the most important item relating to optimal commercial operation of the aircraft. It is necessary to charge the engine manufacturers with building a new engine if it does not already exist in their catalogues.

For the engine manufacturers concerned, anxious to reach the point of profitability for their present projects or those already under development as quickly as possible, it suggests they be prudent: torn between their desire to be the first in a new market segment and the fear of being victims of a "premature leap forward" that can prove fatal to their business, they react in different ways.

In 1981, Pratt & Whitney accounted for 68 percent of the turnover of the United Technologies Group of which it is an affiliate. It also recorded, relative to the previous year, a drop in sales of 30 percent in the civil aircraft engine sector: but the determination exhibited by its directors of maintaining itself as the number one designer in the world, a determination accompanied by the significant financial reserves available to the group, drives this engine manufacturer to try to put together the conditions necessary for the launching of a new engine.

In developing in association with the Japanese industrialists the RJ-500 demonstration engine, Rolls-Royce has gotten a lead on its competitors; but the partners involved in this project do not appear to be in a position to go further with the program without the cooperation of an American engine builder that would be prepared to share the risks and open the market.

Therefore, it is logical that Pratt & Whitney with its German (MTU) and Italian (Fiat) Associates, and Rolls-Royce with its Japanese partners (Ishikawajima, Kawasaki and Mitsubishi) would try to pool their resources to try to develop together the engine the Airframe manufacturers dream about. This is a difficult business if one considers that it will mean putting together a collaborative arrangement with seven partners not to mention two different engine designs: Rolls-Royce (three spools) and Pratt & Whitney (two spools).

For their part, General Electric and SNECMA, who jointly produce the CFM-56, do not envisage, at least for now, attempting a new engine. For economic reasons, the two firms do not see a need for launching a new engine before having exhausted the development potential of the CFM-56; even while pursuing its civilian jet engine programs, General Electric, it seems, is inclined to orient its efforts toward the military market that is judged to be more stable due to the defense policy established by President Reagan and the choices that result from that.

For a long time, the CFM-56 solution was rejected by Airbus Industrie since the performance of that engine was held to be lacking in the area of specific fuel consumption; today the adoption of the French/American engine is still uncertain; but, three important factors have improved its chances. For one thing, Delta Airlines which could be the launching customer for the A-320 in the United States and whose demands caused Airbus Industrie to insist on a new engine has put off its decision on the aircraft to a later date. In addition, the most highly developed version of the CFM-56, the CFM-56-2K2, recently offered to the Airframe manufacturer, will provide almost all the performance expected by the air lines. To these two favorable elements should be added the verdict of the calender. Accepting the hypothesis that they will be able to reach an agreement, Pratt & Whitney and Rolls-Royce will probably not be able to put into commercial service the new engine that would result from their cooperation before 1988; on the other hand, the CFM-56-2K2 would be available from the beginning of 1987, some 12 months earlier; that is an advantage that the European Airframe manufacturer now appears ready to exploit with the airlines interested in the aircraft. Let us hope that Airbus Industrie will succed quickly in its efforts.

CSO: 3102/432

RESEARCHERS SAY NO CERAMIC ENGINE IN NEAR FUTURE

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 22 Jul 82 p7

Text] In the years ahead one can expect initially simple ceramic components will help to make combustion engines more efficient, lighter, quieter and, through improved combustion, less polluting. This is the opinion of Prof Guenther Petzow from Stuttgart, head of the laboratory for Powdered Metallurgy at the Max Planck Institute for Metals Research. So far, he said, "manufacturing and material-related problems of considerable magnitude" have stood in the way of the use of ceramic materials to replace metals in the manufacture of automobile engines. Mass production creates problems mainly because existing production processes are unable to achieve consistent quality in the ceramic materials, which are considerably more heat-resistant compared to metals. Prof Petzow went on to explain that an engine consisting entirely of ceramic materials continued to be a "long-term project," whose realization was by no means Utopian, but which was attended by considerable difficulties.

The widely heralded "revolution in engine construction through the miracle material ceramics" was not quite ready to take place, stressed Prof Petzow. Experimental engines which had been shown recently were only demonstration pieces, which mainly demonstrated the enormous material potential of ceramic engines, which has scarcely been tapped so far. They proved that the ceramic engine works in principle. Even if mass production of the ceramic engine was not yet in sight, almost every manufacturer of engines and turbines in the world, as well as companies in the ceramics industry, often subsidized by substantial state support, was working feverishly on the development of ceramic materials for engines.

Ceramics, the oldest material of man, (from the Greek: ceramos--burned earth) has an excellent potential of becoming the most modern material in engine construction. In the eyes of the scientist, modern ceramics has very little in common with the classical materials that have been in use for more than 10,000 years in the potter's art. "These are a totally new class of tailor-made materials, which can be subjected to temperatures of more than 1,200° C, a heat at which traditional metals without cooling have long since collapsed," said Petzow.

The advance into a range of temperatures, which has so far proved very difficult for technology to penetrate, holds great expectations. Because ceramics provide better heat insulation, the efficiency of combustion engines can be markedly increased, for heat engines utilize energy better as the working temperature increases. Fuel is

burned more efficiently, fewer exhaust emissions are created and the environment is polluted less. Also, Petzow believes, because of the superior insulation of the combustion chamber achieved by the use of ceramics, the cooling system, including the fan, hoses and V-belt, could be dispensed with. This creates hotter exhaust gases, which means, for example, that exhaust-driven turbochargers could be utilized more effectively. They could push even more preheated air into the combustion chambers and thus increase engine output or reduce specific fuel consumption. In the future engineers want to utilize these advantages in the plans for a diesel engine working without a heat exchanger.

9581
CSO: 3102/416

BRIEFS

EXPERIMENTAL TRAIN SETS RECORD--The experimental railroad vehicle VF 1 from Krupp Industrie und Stahlbau, Essen, has attained a simulated speed of over 500 kms/hour in tests on the roller dynamometer in Munich-Freimann. According to Krupp this established a new world record. The roller dynamometer is a track simulator on which the running characteristics of rail vehicles can be studied scientifically, while they remain stationary when running. The experimental vehicle, developed and built by Krupp, which is heading the project, is being used to study the interaction of vehicle and track. In experimental runs between Guetersloh and Neubeckum it has already reached 250 kms/hour, the highest speed currently permitted in the FRG. Higher speeds up to about 350 kms/hour will be possible, Krupp reports, at the planned experimental rail facility, which is to be built from an expanded low-traffic secondary line near Rheine. According to the company, German wheel-on-rail research has no plans to establish rail world speed records, but will continue development of wheel-on-rail technology, finding an optimum balance between what is technically possible and what is economically feasible, at the same time preserving and further expanding the advantages of the railroad as the safest and environmentally most benign form of transportation, even at higher speeds. The results of research obtained so far and those expected should prove that continued wheel-on-rail technology will be technically and economically able to prevail in the face of all old and new transportation technologies over the distances normal for central Europe. [Text] [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 22 Jul p 7] 9581

CSO: 3102/416

END

JPRS 81804

20 September 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 120

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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JPRS 81804

20 September 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

No. 120

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HYBRID-DNA RESEARCH UNDER WAY AT KABI GEN

Stockholm KEMISK TIDSKRIFT in Swedish No 7 Jun 82 pp 25-26

/Article by Boel Jonsson: "Hybrid-DNA--Exciting Work for Organic Chemist"/

/Text/ Anette Elmblad has been working for 1 year with one of the newest specialties that a chemist can pursue--the hybrid DNA technique.

"It is an incredibly interesting area in a state of rapid development, on which a great deal of money is being spent. Of course, I was very hesitant in the beginning," Anette says.

Anette Elmblad is an organic chemist and works at Kabi Gen. It is probably, in proportion to its small size, one of the best known companies in Sweden. The personnel consists of three organic chemists (to be expanded to five) and eight microbiologists plus a managing director, a deputy managing director and two secretaries. They have no premises of their own but rent a few floors of laboratory space from the pharmaceutical company Kabi Vitrum, which owns 50 percent of Kabi Gen. There, they can also obtain administrative services.

Sequences of DNA are produced with the aid of a machine for automatic DNA synthesis; this is a prototype which was constructed at Kabi Gen. (See KEMISK TIDSKRIFT 4/82, p 45 "Automatic Fixed-Phase Synthesis".)

Mathematics, Chemistry, Biochemistry

Anette studied mathematics and chemistry at the university. First, two units of mathematics and the basic chemistry course (40 points) and after that two units each of biochemistry and organic chemistry.

"Those sections of chemistry seemed to me to be the most concrete."

"The next step in my development was to have children, when I finished college in 1977."

"Before winding up here I first worked for 1 year at Kabi Vitrum with purification of swine insulin , a job which to some extent is connected with what I am doing now, because insulin is one of the human proteins which can now be produced with hybrid DNA technique, although as yet to a limited extent."

"For 1 year I also worked in the Biochemistry Department of the Royal Institute of Technology on a basic research project involving phenol-degradable enzymes."

"The hybrid-DNA technique occupies mostly microbiologists and molecular biologists. The greater part of the work is done by them. The division of labor is done in such a way that the organic chemists synthesize small pieces, short gene sequences which the microbiologists use to identify the natural, human gene. It is extremely rare that more than one section of the nucleotide sequence is identified in a whole gene. The natural gene material in the form of m-RNA is taken from human cells from the organ one is interested in."

"My biochemistry is useful when I analyze the result of the synthesis. We check that the nucleotide sequence is the correct one, the one we are looking for, by means of a combination of enzyme degradation and two-dimensional chromatography."

"Our automatic synthesis machine has a high degree of accuracy. One nucleotide at a time is connected up and the result then lies at 90-95 percent. But this is a number which decreases rapidly the longer the sequence you do. This is why short pieces are done and later connected," Anette says.

"Fifteen nucleotides is the usual length, to be compared with for example an interferon gene, which consists of 514 base pairs. Even so, that is an unusually short gene."

Secret Research

At Kabi Gen's synthesis department where Anette works the activity is primarily aimed at the development of methods within the field, but certain projects commissioned by departments of higher education institutions are also undertaken, something which Kabi Gen is alone in doing, in Sweden. In the United States there are some companies which deliver oligomers (synthetic nucleotides) on order. Under the management of Kabi Vitrum in Strangnas the production of human growth hormone (with hybrid-DNA-equipped E-coli bacteria) has advanced far. It is expected that within 1 year larger amounts will be produced. The development of HGH (Human Growth Hormone) was done in cooperation with the U.S. company Genentech, with which Kabi Gen has a cooperation agreement.

Up to now, the hybrid-DNA technique has been nothing but a resource-consuming field. Large sums have been invested, particularly in the United States, which have not yet yielded any commercial results. This has the effect that the research and work within the area is surrounded by mystery-making to a greater extent, perhaps, than normal.

"People say that it is noticeable at the symposia. What is said there and what is the subject of the talks are things which have already been published. No one wants to talk about his newest discoveries, in case someone else should steal the idea before it has been patented."

"Sure, it would be fantastic if all the research groups could cooperate. Then the results would be enormous. But most of the research, both at the universities and in industry, is secret; for understandable reasons, in our competitive society."

Goal-Oriented Instead of Basic Research

"The fact is that I think the atmosphere here is more open than in a department at a higher education institution. The academic world so easily becomes a world in itself. Here, our outside contact network becomes greater. We cooperate with, among others, Karolinska Institute, where a research group is working on the solution of amino acid sequences for, among other things, the proteins we are working with."

"The next step in the development work we are doing here is to make a synthetic gene. That is to say, not only pieces of the DNA helix but an entire gene."

Something which also makes Anette feel more comfortable at Kabi Gen is that the research there is goal-oriented. The major portion of the research conducted at higher institutions is basic research.

"It is good that there are people who want to do this, but I prefer to see more rapid results."

Genes and Ethics

One discussion, which has followed the hybrid-DNA technique since one of the researchers in the field, American Paul Berg, himself brought up the issue (issues), deals with the ethical problems and the potentially negative consequences of the technique which are difficult to evaluate.

"In the beginning when hybrid-DNA technique was something new I was very sceptical. At that time there were also so many question marks. It was not clear to people for example whether the bacteria with altered DNA, with which people worked in the laboratory, could get loose and cause who knows what. This has now been studied and it is known that the bacteria cannot survive outside the laboratory environment."

"But discussions about the consequences of the technique must of course constantly continue. Not least important is that all types of people should participate in the discussion."

However, Anette does agree that there are certainly examples of specialists who become so involved in their own research that they see only their own viewpoints, and they become blind to any objections.

Traditional Professional Roles

Anette is fascinated by her area of work, and it is still, after 1 year, very new to her.

"Right now I cannot imagine anything I would rather work with."

"Here I also have the opportunity of travelling abroad to symposia, despite the fact that I do not have a PhD, something which is a prerequisite in many places."

"It is not necessary to work at a higher institution in order to get a PhD. One of my colleagues here is registered at an institution but is writing a dissertation on the work here."

"I myself have not felt any incentive to do that. In addition, I believe that if a girl is going to get a PhD she should do so before having children, otherwise the work could drag on forever."

But unfortunately we girls often say out of old habit: Oh, I couldn't possibly do that. Although if you want to be for example the leader of a research group it is necessary to have written a dissertation."

"It is a pity that there is still such a strict division between female and male professions."

"It is a pity, above all because it is in the traditional male professions that there are any job opportunities at all, even for girls," in Anette's opinion.

11949
CSO: 3102/419

ELECTRONICS GIANTS COORDINATE RESEARCH EFFORTS AGAINST JAPAN

Paris LE MATIN in French 6 Aug 82 p 5

[Article by Olivier Peretie]

[Text] Twelve of the largest groups in France, Great Britain, Germany, and Italy, are considering joining their research efforts against the Japanese.

Electronics is definitely becoming the major industrial bet in the closing years of the 20th Century. For the first time, the Europeans seem to have become aware of the magnitude of the challenge issued by their American and Japanese rivals. For the first time, they seem to respond by uniting their forces. Twelve large French, British, Italian, and German electronics groups are now engaged in a project to coordinate their research efforts as part of an European Community program called ESPRIT (European Strategic Program for Research in Information Technology).

They met without fanfare last week in Brussels, around a certain Christopher Layton, special counsel to the European Community on information technology and electronics. They all spoke English, but their accents revealed their origins more readily than their professional calling cards. Usually very discreet about their work and projects, they spoke of the future, and more exactly, of their joint future.

The participants in this semi-confidential meeting all belong to the research divisions and headquarters of twelve of the largest European electronics and informatics firms. These people control the future of hundreds of thousands employees at Thomson-CSF, CIT-Alcatel, and CII-Honeywell Bull in France, at General Electric Cy, ICL, and Plessey in Great Britain, at Siemens, AEG, and Nixdorf in FRG, and at Olivetti and Stet in Italy. And maybe even the future of the entire European industry.

These twelve groups are confronting the competition, not to say absolute domination in some sectors, of the Americans and the Japanese. On both sides of the Pacific, the competition in microelectronics (semiconductors, memories, microprocessors) is such that the Europeans are increasingly relegated to a purely marginal role and to technologic dependency. Yet this market, currently amounting to 9-10 billion francs, includes all the strategic products which lie at the heart of tomorrow's electronic development, and almost all of which the Europeans import or manufacture under license.

Last week's meeting is therefore of capital importance. The delegates of the twelve European groups in fact laid the foundations of a research and development cooperation program which they named ESPRIT. In a first stage, which could begin as early as 1984, this would involve the joint development of the sophisticated machines necessary to produce chips, those highly integrated circuits of the next generations. The EEC has already released 275 million francs for the development of some prototypes of this equipment.

Eventually, it would mean much further progress in the unification of the various research and development programs. This is the only solution for responding to the Japanese projects of Hitachi, Nippon Electric, or Matsushita. Supported by MITI, the Ministry of Industry and Foreign Trade in Tokyo, these three giants already have a strong lead, to the point where some ten American electronics and informatics companies, worried by the Japanese domination recently experienced on sensitive markets such as computer memories, have already decided to coordinate their research efforts in order to succeed as rapidly and inexpensively as possible to produce the raw material of the electronics energy, semiconductors. This is a market of 200 billion dollars by the end of this decade.

11,023
CSO: 3102/412

FIRST DETAILS PUBLISHED ON ELECTRONICS PLAN

Paris ZERO UN INFORMATIQUE HEBDO in French 9 Aug 82 p 9

[Article by Jean-Louis Cousin]

[Text] Will the CII-HB product policy be redefined? Will there be a very large French computer? How about 32-bit minis? What will be the exact functions of Thomson, CII-HB, CGE, and Matra in components, mini-informatics, telecommunications, or office automation? How about military investments? Those who were awaiting details, are avid for information following the announcement by the Council of Ministers of 28 July, of the program for the electronics industry (01 HEBDO No 708). Before the short government vacation, the Ministry of Research and Industry published a memorandum providing some guidelines of its intentions.

To begin with, money, without which it would be unrealistic to set the goals that will henceforth be ours. As we indicated last week, the sum of 140 billion francs must represent the total investment derived from the state, from public and private enterprises, as well as from subsidiaries of foreign companies during the 1982-1986 period.

If we are to believe some of the rumors, telecommunications and professional electronics would receive a very large portion of this total. Indeed, merely maintaining the investment effort of PTT (Mail, Telephone, and Telecommunications) and the armed forces, would amount to 80 billion francs.

That leaves 60 billion to be distributed among the other nine sectors. In what follows, we provide some estimates for each of them.

What will be the government's contribution to these funds? If investments had maintained their current growth rates, the total amount for the next five years would have been 90 billion francs, of which the state would have supplied 25 billion francs.

Additional Effort

But the additional effort must now bring this contribution to slightly over twice as much (on the order of 55 billion). This means that the government would have to find 5 billion francs per year (in 1982 francs). At at time when austerity is more appropriately the order of the day, this is likely to raise some eyebrows among those who are holding the purse strings.

In terms of industrial policy, the ministry's memo makes the following points:

"French industry will have to concentrate its forces whether dealing with nationalized companies (Thomson, CII-HB, CGE, Matra), private enterprises, and PMI (small and medium-sized enterprises).

The government will use the weight of the nationalized sector (49 percent of the industry) to develop strategic sectors.... In each sector, the strategies of the national groups will have to be concerted so as to include the need for concentrating these investments to the greatest possible extent on one or two groups."

Concerning domestic competition within France, the memo stated:

"For sectors in which competition among industrial groups could occur, the allocation of state aid will be based on criteria of competence and correlation with overall strategy. An agreement will nevertheless be sought, in concert with the enterprises."

The PMI sector is not overlooked:

"At the other end of the spectrum, the PMI sector as a whole must constitute an essential resource in innovation, both in research and in technology. This vocation must be encouraged, both structurally and financially, by the government. The role of subcontractor to the large enterprises will have to be as profitable as possible for PMI's."

The following indications are provided for operation within the framework of the plan thus outlined:

"The national enterprises will present to the government their proposals for action (enterprise plans), which will describe strategies to be used for the selected goals, expected structural changes, annual budgets, and associated financing needs."

Plan Contracts

"These plans, established under the responsibility of enterprise managements, will result from extensive internal agreements, both technical and social, with social partners.

A plan contract between the state and each enterprise, formulated on the basis of the enterprise plan, will define the means contributed by each of the parties to reach the established goals.

For the private enterprise sector, agreements will be proposed which will make it possible to associate these enterprises in the national effort, and will make the allocation of state financial support dependent on obligations for research, investment, and financial contributions on the part of stockholders."

These are the essential points of the government's projects for each of the 11 sectors under consideration, with estimated figures (based on current rumors) for the allocated credits.

Components

In integrated circuits, the memo announces a "regrouping of industrial centers" to be accompanied by a reinforced effort of research and development. This declaration of intent tends to support, among other things, the hypothesis of a forthcoming combination of Eurotechnique (51 percent SPGM, 49 percent National Semiconductor) and Thomson Efcis (henceforth integrating Thomson's other subsidiary, DSC), to form a strengthened MOS center.

In discreet circuits, the effort would be concentrated on growth areas (hyperfrequency, power circuits), and on GaAs (gallium arsenide) technology. In passive circuits, the objective would be to attempt to limit our market coverage loss through the exploitation of several specific slots and licensing agreements.

The estimated credits are of the order of 10 billion francs.

Consumer Electronics

A major effort will be undertaken in color television. French production objectives will be sought for the new generation of products (videotape and electronic toys in particular). An R&D effort will be pursued for the "new products" which will appear after 1986 (cameras, video, latest generation videotapes, digital audio records, information terminals, and so on). International cooperation agreements will be sought for this purpose.

The estimated credits are 7 billion francs.

Intermediate Systems: Consolidated Line

The memo announces a "structural improvement" and "a continued effort of internal organization" aimed at a return of competitivity. It goes on to provide the following details: "The line of intermediate systems (management), which corresponds to a large slot of the European market, and to a steady investment on the part of CII-HB for several years, will be consolidated. A particular effort will be made to offer possibilities for connecting dissimilar equipment using the architecture of CII-HB's DSA networks."

In mini-informatics and distributed informatics, efforts will be made to avoid duplication of R&D expenses, as well as the dispersion of industrial and commercial investments. The sector will benefit from efforts approved within the national plan as "building blocks for minicomputers."

"In micro-informatics, a large effort will be devoted to mass production while encouraging individual innovation."

The estimated credits are 13 billion francs.

Office Automation

The guideline in this area is: "Consolidation of existing strong points: private telephones and electronic mail, combined with the will to invest in mini-informatics, should allow France to establish its position in this rapidly

growing market, and give it time to recover its weaknesses, particularly in reprographics, electronic typewriters, and printers, by taking advantage of notable technologies. The development of new products (text processing, electronic filing, networks, and so on) will facilitate this penetration.

The estimated credits are somewhat over 1.5 billion francs.

Software and Services

France's position is deemed to be good. It is however planned to improve it by stressing the industrial nature of production, by investments in software, and by a significant development of data banks.

The estimated credits are 4.5 billion francs.

Industrial Informatics and Automation

Innovation demand and the activities of informatics engineering companies will be encouraged as part of a "productics" program (see last week's 01 HEBDO No 708, pages 4 and 5).

The estimated credits are somewhat over 3 billion francs.

Space Industry

European collaboration must be reinforced in order to integrate national programs. An effort to penetrate countries without space activities will be undertaken in parallel, both on technical and political grounds.

All this activity will be carried out as part of the already determined development of Ariane 4 and the launching of Spot 2.

The estimated credits are 15 billion francs.

Professional Electronics

Our strong exporting position in the military domain (7.5 percent of the world market) is expected to be consolidated. In addition, the civilian markets (audiovisual, airport infrastructures, and so on) seem to be developed, primarily thanks to the government, and should make it possible to significantly increase our share of the world market.

The estimated credits are 25 billion francs.

Telecommunications

PTT is pursuing a policy of active support of the French industry, directly and through public laboratories. As stated in the memo, this is "in order to rapidly implement the current programs of enterprises through products, services, and new systems."

The estimated credits are 55 billion francs.

Scientific Instrumentation and Measurements

In addition to industrial consolidation, a slot policy is being planned, based on the good technical environment that is available, and on a research and development effort.

The estimated credits are 2 billion francs.

Medical Electronics

The already real commercial presence of French enterprises must be consolidated by the industrial development of new products, digital radiology, ultrasonics, and so on).

The estimated credits are 3 billion francs.

"New details will be supplied in September," we were told by Herve Lorenzi, responsible for informatics and electronics in the new cabinet of Jean-Pierre Chevenement. While waiting for them, those who are best informed might be able to use the above for sketching the industrial landscape of tomorrow's French electronics.

11,023
CSO: 3102/427

BRIEFS

POWER CHIP--While many microelectronics research laboratories are working on silicon circuits, the Laboratories for Applied Electronics and Physics (LEP) of Limeil Brevannes, in the Paris region, are exploring and exploiting the properties of another semiconductor, gallium arsenide (GaAs). LEP researchers have thus produced microwave power transistors with remarkable performances (Communique LEP CP 82-67). Unlike silicon bipolar power transistors, which are difficult to use beyond 6 GHz, GaAs field effect transistors can operate at much higher frequencies. Composed of 12 basic cells, the LEP power transistors deliver over 3 W at up to 12 GHz. These transistors are therefore particularly interesting for high-density, small-size telecommunications systems, and notably for equipment loaded aboard satellites. Within a few years, a large number of traveling wave tubes will be replaced by transistors of this type, which are expected to have a much longer life than vacuum tubes. Let us hope that these encouraging results, comparable to those obtained in Japan and United States will soon lead to industrial production in France. [Text] [Paris LA RECHERCHE in French Jul-Aug 82 p 893] 11,023

CSO: 3102/427

MODERN SYSTEMS FOR COMPUTER-AIDED DESIGN AT BMW

Leinfelden-Echterdingen DIE COMPUTER ZEITUNG in German 16 Jun 82 p 23

[Text] To an increasing degree CAD [computer-aided design] systems are being introduced into design offices and display screens are replacing design at the drawing board. Today a CAD system can increase a designer's productivity. Graphic display terminals have an important function in the CAD system. They convert values which are determined by the computer into dots, lines and combined curves and indicate to the designer the correct way to solve his problem.

Designers at BMW in Munich have also seen what advantages modern CAD systems offer. For years they have been making use of this advanced design technology. Thus, for example, finite element calculations by mesh generations for finite element networks, but mainly body designs are done by computers produced by Amdahl, Control Data and Prime Computer. In the interplay between computer and peripheral equipment Tektronix model 4014 and 618 display terminals have taken on an important function. They support the designer in the body construction sector.

Thus, prior to output on plotters the designer can observe the graphic representations in the previewing process via a Tektronix display terminal and can then decide whether the drawing is satisfactory and whether he wants to take plotter time. Dr Schuster, department head for CAD and CAM systems at BMW, reports that "formerly, when there were still no graphic display screens, graphic outputs were mainly produced via plotters. That was complicated because every time a drawing was incorrect, the plotting had to be done over."

Today BMW has about 30 Tektronix display terminals in use. The first graphic display screens were installed in 1977. In recapitulating, Dr Schuster says: "At that time we made the decision for this equipment because it can be used for graphics at an affordable price." The display terminals are hooked up with the Cyber 172, Prime 400 and 750 computers and, together with the IBM GA 3777, with the Amdahl V/7b. One of the first and principal applications even today is the use of the Tektronix equipment in the body design sector to represent the digitalized lines for handling the body shell. "With the help of graphic display screens the digitalizing process can be substantially accelerated by means of interactive interventions," says Dr Schuster.

In the intermediate steps the graphic display screens replace output from the drawing table by output from the display screen. Only drafts of a drawing are made on the drawing table. For reasons of quality a very precise plotter drawing must be produced as an end product, but in the initial stages the display screens are utilized to get this result. BMW is satisfied with the maintenance of the Tektronix display terminals. The response time according to Dr Schuster is normal and the technical service functions reliably. Also, the split of Rhode and Schwarz in the previous year created no problems in servicing the equipment.

As far as the future is concerned, the intention is to continue with modern graphic display screens. Of course, with graphics there is still the problem today of no standardization of the graphic interfaces. However, according to Dr Schuster, there are national and international efforts to establish this standardization. Recommendations for norms are under discussion and with its equipment Tektronix has had a certain influence on this development.

In conclusion Dr Schuster says: "In the future the equipment must have more intelligence. The good thing about this is that the 4110 series from Tektronix today is in keeping with this trend. Beyond that, additional capabilities will be necessary in order to speed up decentralized use of graphic work stations which in many large companies is necessary. A further line of development will result from the trend toward raster screens. In this case picture formation times and resolution must be improved in order to achieve acceptable work stations in the CAD sector."

12124
CSO: 3102/415

FRG STUDENTS OF PLASTICS PROCESSING LEARN CAD

Helsingborg PLASTFORUM SCANDINAVIA in Swedish No 6, 1982 p 49

[Article: "FRG Students of Plastics Trained to Use CAD Technique"]

[Text] CAD is the established term for design work with the aid of computers. It is no wonder that tool designers have begun to utilize the possibilities and advantages of this method.

IKV--the Institute for Plastics Processing--in Aachen has been working in this field for several years. The first step was to complete the basic data--required for programming--and this is now practically finished.

The second step was to get these data to function in machine processing. In order to test this the institute set up a pilot station in the form of a complete CAD work area, which was modernized before the major colloquium this year.

The work area consists of:

1. A central Perkin Elmer 7320 computer
2. 2 terminals (graphic)
3. An alphanumerical terminal
4. A plotter

IKV Aachen has now advanced to the point where students are being taught the CAD technique for plastics purposes. At the same time as this is being done, commissions are being sought from industry. In this manner the industry receives help with its problems at the same time as the IKV is able to improve its programs and adjust them to industrial realities.

At present the CAD technique for molding tools for injection molding is the most important, but in the future molds for compression molding, transfer molding, foaming, thermoforming and blow molding will be covered.

CAD Technique for Extrusion

Extrusion nozzles are also very well suited to CAD computation. This applies primarily to geometrically intricate profiles such as window profiles. This

involves three-dimensional filling processes, which up to now could only be carried out after many years of in-house experience. To be sure, calculations were always made, but were always based on greatly simplified and thus unpermitted assumptions. Even the computational capacities contained in large mathematical computers up to now have not been sufficient for economical application in industry.

However, the IKV has continued its work on the basis of the finite element method (FEM) in the hopes that new types of computers will soon be able to carry out such calculations in an economical manner.

With the FEM technique the geometry of the flow channel is structured in very small volume segments--finite elements--. In the next operation the three-dimensional velocity field inside and outside the nozzle is calculated. Included in the considerations for this is the structural viscosity of the material and an assumed velocity profile in the flow channel.

The computer calculates the actual difference from a general velocity profile (inside the nozzle a parabolic profile; outside the nozzle a block profile) through iterative calculation. If the plastic has good flow characteristics (styrene plastic with low molecular weight) the calculated profile will agree with the actual one. However, in dealing with material with higher molecular weight, for example HDPE /high density polyethylene/, yet another calculation step follows in which the force field which occurs through the deformation of the melt is sought, or, respectively, the elastic deformation which is reversible is sought. These are responsible for the deformation of the plastic profile as soon as it leaves the nozzle.

The future goal is that through a dialog between the designer and the computer a point will be reached where the desired flow conditions in the nozzle and in this manner the desired geometry and measurements of the plastic profile will be achieved.

CAD Technique for Injection Molding

Injection molding of technically high-quality molded goods up to now required great efforts in construction, test operation, testing, trimming and adjusting before an acceptable result was finally arrived at. One of the reasons was that it was necessary to guess how the cavity was filled during injection, and where the filler should best be located.

This is facilitated by the so-called fill picture construction which was developed in Aachen and which shows where weaknesses in the flow path of the melt must be anticipated. The Aachen system is now also applicable to fiber-reinforced thermoplastics.

Another program makes it possible to test such details while they are still on the monitor screen of the CAD facility, that is to say before the molding tool and the piece have been manufactured. Here as well the FEM method enables calculation work with all kinds of loads, mechanical, dynamic, thermal and chemical. Much money can be saved on "trouble-shooting" long before the pieces have been manufactured.

In conclusion, CAD computers can help the designer with the choice of material from an economic/technical viewpoint, with the filling sequence, the location of knitting points vis-a-vis the placement of the filler, placement of reinforcement ribs, deformation in the molding plates, positioning, size and number of the heating channels, thermal effect for and position, size and number of the heating channels, thermal effect for hot channel molds, cooling time and cycle time calculations, etc.

11949
CSO: 3102/421

NEW BRITISH METHOD FOR MAKING PLASTICS MOLDS

Helsingborg PLASTFORUM SCANDINAVIA in Swedish No 6, 1982 p 66

/Article: "MISA--New British Method for Manufacturing Molds"/

/Text/ A new method for mold production called MISA for Molds in Superplastic Alloys has been developed at Birmingham University. With the MISA method, models of brass or steel can be perfectly reproduced without problems with casting shrinkage etc. Such molding tools can be produced in a short time, at costs which are comparable to aluminum casting. MISA is a stamping method in a superplastic alloy, as is shown here by Robin Penfold.

The characteristics of the alloys in the MISA process are that they are plastic at 270°C, but that they are harder than copper at room temperature. The material can be re[illegible]ed and is therefore suitable for short series molds. A hydraulic press (hand operated) and heated plates are used to produce the cavity. The stamping gives very good reproduction at 150 kp/cm^2.

MISA is said to be a simple, rapid and cheap method for the production of molds, intended both for prototypes and production. A highly glossy surface is achieved without the need for polishing, and the measurements are determined exclusively by the stamping model.

Material

The mold material in the MISA process is based on zinc, aluminum or other components, specially prepared into a fine-grained, superplastic state.

At low deformation speeds and within specified temperatures these materials show extreme plasticity and ductility.

At 265°C the rigidity of one of the MISA alloys, Z 21, is lower than cold lead, but at 20°C it is harder than copper. At temperatures below 0°C the hardness increases to nearly that of soft steel.

At 265°C it is therefore possible to press models of brass or steel into Z 21 without damaging the model material. Every detail of a polished, protruding or recessed surface is accurately reproduced.

Another MISA alloy, AS 5, based on aluminum-silicon, has a higher corrosion resistance and is therefore recommended for colored plastics. The alloy also has greater temperature resistance and is consequently used with advantage for polyamide injection molding. The alloy is superplastic at 350°C.

So far the MISA alloys are being produced in sheets with the measurements 30 x 30 x 2.5 cm, as well as in round billets 45 cm long and 7 cm in diameter.

Applications

The MISA process has been tested by Fordham Plastics, among others, which manufactured molding tools for high-precision acetal resin. A conventional molding tool had already been made from steel and the MISA mold was made mostly to evaluate the new technique.

After injection molding with both tools, the products could not be distinguished in any way. No wear could be determined after 1,600 shots into the MISA mold.

Another molding tool was manufactured for British Home Stores. In this case the purpose was to produce a hook intended to display hosiery in stores.

In the first batch the customer received 1,200 hooks, after which the mold was sent to the regular injection molder, who so far has produced 250,000 hooks in the same mold without problems.

The cost will of course vary with the complexity, but about 3,000 kronor is indicated as typical for a small mold. If the customer provides a model, the cost will be considerably affected.

Birmingham University has various units which are responsible for marketing the inventions made there. The MISA process is handled by Wolfson Industrial Unit, which has also patented the method.

11949
CSO: 3102/421

CURRENT RESEARCH IN CERAMICS TECHNOLOGY OUTLINED

Paris L'USINE NOUVELLE in French 24 Jun 82 pp 61-63

[Article by Pierre Laperrousaz]

[Excerpts] In a 10-year period, the United States has spent $100 million on the study of ceramics for applications with gas turbines. Between 1974 and 1983, the Germans will have invested 96 million marks in the same field. In 1981, the Japanese MITI [Ministry of International Trade and Industry] began a "ceramization" program for thermal engines, to cost $60 million spread over 10 years. And this is only part of the money being spent on ceramics research in those countries. In France, where things got off to a later start, there are several industrial and university groups at work, but it is hard to evaluate the total funding for their research.

There can be no doubt that the major industrialized countries believe in the future of ceramics technology. This technology does seem to offer the only solution in high-temperature structural applications, where super-alloys do not work. And the fact that research is focusing on thermal engines (gas turbines, diesel, gasoline engines) is easy to explain. The case for application is ideal: in order to increase the efficiency of these engines, light materials are sought (ceramics have a density of 3 to 5.6), materials which are resistent to heat and to thermal shock, and which have good mechanical properties. Moreover, the vast potential market justifies major efforts in research and the establishment of an industry that may later be able to supply other industrial sectors which are not economically viable in isolation.

These materials seem to have the greatest uses in mechanical and especially thermo-mechanical applications. Some of these are already in commercial use: ball bearings for hot parts of aircraft engines made of silicon nitride sintered under pressure, made in the United States; parts of fuel burners made of sintered reactive silicon nitride, made by Rosenthal in Germany; cutting tools made of sialon, mechanical rings providing a tight seal for the primary pumps in nuclear power plants, made of Refel silicon carbine, etc.

It is, however, thermal engine applications that seem most promising: rotor and stator, combustion chamber, and other parts of gas turbines for ground vehicles, and piston heads, precombustion chamber, collars, and turbocharger rotor for diesel engines. The United States is leading in the field of turbines with two major 100 hp turbine projects: the AGT [Advanced Gas Turbine] 100 of General Motors, and the AGT 101 of Ford and Garrett. The

Japanese are concentrating more on the gasoline and diesel engine. Some of the French companies--Peugeot, Renault, SEMT [Thermal Engine Research Company, a subsidiary of CGE-Alsthom--are also interested in the diesel engine applications. There are plans to "adiabitize" engines in order to recover the maximum calories from the exhaust gases in a turbocompressor, which may itself be made of ceramics.

It is probable that not one, but several ceramics will be used. "There will be room for everyone," says Gaston Sifre, the deputy director of research and scientific affairs at PSA [Peugeot SA], which is thinking of silicon carbide primarily for moving parts, and sialon and zirconium for parts of combustion chambers. At the SEMT, partially stabilized zirconium collars, manufactured by Lafarge Refractaires, are being tested on a diesel (200 hp per cylinder). They hope to achieve a gain of 8 to 10 percent in the calories provided by the fuel.

Other parts may also be considered: piston bosses, parts which undergo wear (tappet cams, for example). But these projects should not be expected to produce any results before at least 5 years, people at the SEMT say.

In any event, the production capacity is available. There are two major industrial production centers in this field: Lafarge Refractaires and Ceraver (CGE [General Electric Company] group. Lafarge has been concentrating primarily on partially stabilized zirconium, but it has also developed a sialon which seems to be giving good results when used in a cutting tool. Although less advanced in its work with silicon carbides and nitrides, it does have the equipment to sinter under pressure, with which prototype parts have been developed for the automobile industry. Ceraver, which benefits from the support of the CGE laboratory at Marcoussis, produces a sialon and silicon carbide by natural sintering using a procedure close to the Carborundum process (there should be no patent problems, says Ceraver). The company is also developing a silicon carbide heat exchanger, which makes use of the very high thermal conductivity of this material, which operates up to 1600-1700°C. A prototype has been sent to Coudamy, a furnace maker in Limoges, which plans to combine it with a burner to preheat combustion air by smoke.

In addition to industrial labs, research is going on in major research facilities such as the ONERA [National Office for Aero-space Studies and Research], the CEA [Atomic Energy Commission], and the CNRS [National Scientific Research Center], and in university research laboraties. The materials center of the Mining School in Corbeil is interested more particularly in composites. The laboratory of new ceramics in Limoges is studying natural sintering and sintering under pressure of nitrides, carbides, borides, etc., along with plasma deposits, and most recently, reinforced ceramics. Three laboratories--those of the Central School in Lyon, the Mining school in Saint-Etienne, and the INSA [National Institute of Applied Sciences] in Lyon --have just joined together to form the CRRACS [Rhone-Alpes Special Ceramics Research Center]. They will study the following materials: borides, carbides (of zirconium, silicon), nitrides (of silicon, boron), sialons, etc. the center is to have an isostatic pressing facility and the Saint-Etienne laboratory has a hot press with computerized control and data acquisition.

Characteristics of Different Ceramics

		1	2	3	4	5	6
		Alumine	Zircone stabilisée	Zircone partiellement stabilisée	Nitrure de silicium (frittage nitrurant)	Nitrure de silicium (frittage sous charge)	Carbure de silicium (avec bore et carbone)
7	Densité apparente	3,92 à 3,98	5,4 à 5,6	5,4 à 5,6	2,4 à 2,6	3,2	3,1
8	Coefficient de dilatation de l'ambiante à 1 000 °C	8,2 à $8,7\times10^{-6}$	8 à 10×10^{-6}	7 à 8×10^{-6}	2,8 à 3×10^{-6}	$3,2\times10^{-6}$	$3,5\times10^{-6}$
9	Dureté Vickers	⩾ 1 100	1 100 à 1 500	⩾ 1 100	1 500 à 1 700	⩾ 2 000	⩾ 2 500
10	Résistance à la flexion à l'ambiante (MPa)	250 à 400	250 à 350	500 à 750	150 à 300	700 à 1 000	400 à 500
11	Résistance à la compression à l'ambiante (MPa)	2 000 à 3 000	2 000 à 3 000	4 000 à 6 000	1 000 à 2 500	6 000 à 8 000	3 000 à 3 500
12	Module d'Young (GPa)	240 à 320	130 à 150	130 à 150	150 à 200	300 à 350	410 à 430
13	Conductibilité thermique à l'ambiante (W/mx°K)	4 à 6	1	1	10 à 20	30	90 à 100
14	Résistance au choc thermique	mauvaise	médiocre	bonne	bonne	bonne	bonne

One Handicap: Technical Ceramics are Fragile

To a great extent, the future of technical ceramics will depend on the solution provided by these research programs to a major problem that arises when considering the utilization of these materials in mechanics: their fragility. Unlike metals, ceramics are highly sensitive to local concentrations of stresses. And whereas a metal "holds" by spreading out the stress by plastic deformation, the ceramic material persistently breaks. This weakness is worsened by the phenomenon of "subcritical cracking." Under tensile stress, even lower than the breaking point, structural defects (which are almost impossible to avoid in ceramics) may slowly enlarge and cause a delayed break in the material.

In addition, these defects are dispersed randomly in ceramic parts, so that the results of stress measurements when ceramics are broken may be widely scattered. These two characteristics of ceramics still form the major obstacle to their industrial use, according to Jean-Marie Bind of ONERA. As a result, "research groups must become familiar with a new concept: that of the mechanical resistance of a fragile part on terms of probability of survival," he said. In terms of quality control of these parts, they must use a strength test, eliminating defective parts by subjecting them to a stress,field, comparable to but greater than operational stress, so that the survivors will have an acceptable probability of destruction when used.

In the case of rotors for the Ford vehicle turbine, which in actual operation undergo stresses of 200 MPa, the strength test should be done at 390 MPa in order to guarantee an operational life of 25 hours. The research facilities will also have to revise their "metals" mentality when designing parts in order to avoid local concentrations of stresses and to make the ceramics work with their weaknesses. One example: the high-temperature gas turbine with a revolutionary design which has been under study by ONERA. The blades, made of Ceraver silicon carbine, are hollow and are mounted on superalloy

spindles. The turbine's rotation flattens the blades on the periphery of the rotor and makes the ceramic work in compression (while in a conventional turbine the blades work in traction). Another concern which the designer must remember is the metal-ceramic joint. Breaks here are the cause of many failures. There are solutions (adhesives, a superalloy "gasket-seal" mechanical bond in superalloys, thermocompression, bonding by diffusion), but bonding still remains a limiting factor, to such an extent there is always an interest in reducing the need for bonding by changing the design of the parts.

One Response to Fragility: Composites

The answer to the problem of the fragility of ceramics will probably come from a new generation of materials: composites. Partially stabilized zirconium is already part of this in to the category of dispersed-particle composites. Then there are short-fiber composites (several millimeters in length). Two possibilities are already available on the market: silicon carbide fibers made by Nippon Carbon, and alumina fibers made by Dupont de Nemours. In France, the SEP [European Propulsion Company] and Lafarge Refractaires have joined together in a GIE [Economic Interest Group], the GEFIC [Ceramic Fibers Research Group], which is interested in the same type of products. The goal is to attain a production of several tons per year between now and the end of 1985. The production of short-fiber composites uses the same technologies as are used in conventional ceramics, particularly sintering under pressure. In this way, a silicon nitride reinforced with silicon carbide fibers has its mechanical holding power doubled.

But the commercially available carbide fibers do not consist solely of good points: their resistance to high temperatures is lower than that of solid carbide fibers. Long-fiber composites require more sophisticated manufacturing methods, which are totally different from the methods normally used in the ceramic industry. They start from a three-dimensional reinforced piece, to which the matrix is added by vapor-phase chemical deposition, liquid impregnation. France is apparently fairly well advanced in this field, with the work being done by companies such as the SEP and Aerolor. But, cautions Jean-Marie Bind: "There is still a great deal of work remaining to be done, both in terms of the use of these materials, and the study of the mechanics of their breakage."

7679
CSO: 3102/388

MINISMELTER FOR CONTINUOUS CASTING OF NONFERROUS METALS

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
15 Jul 82 p 7

[Article: "Continuous Casting Unit From NE Metals"]

[Text] Frankfurt, 14 July--One of the greatest technical advances in the steel industry since WW II is without doubt the continuous casting process. And as important as this energy and work saving process may be for the survival of many steel companies in the face of increasing international competition and the surplus of steel, it has had only a slight impact on production at NE [Neunkircher Eisenwerk] metals.

In continuous casting, the casting process is integrated with the steelmaking process. The molten steel issuing from the furnace or converter flows into a ladle and out of this as a continuous billet with cooling and increasing solidification on to the rolling mill where it is immediately processed into semifinished material. In conventional steel mills on the other hand, the steel is poured into molds producing ingots which are transported to the rolling mill on demand where they are brought up to a uniform rolling temperature in pit furnaces. It goes without saying that this process is extremely wasteful of energy.

At NE Metals completely different production conditions prevail. These metals are in all cases considerably more valuable than raw steel, and the production quantities are smaller. Brass currently costs DM 3,200 per ton and aluminum averages DM 3,700 per ton. Their production demands much more precise process control at a much lower production scale compared to steelmaking. This is especially true for silver and all other precious metals. Now one can, in perhaps a surprising manner, melt and continuously cast precious metals in a single process, specifically with the aid of a minismelting furnace with an integrated continuous casting unit. According to a report in the FINANCIAL TIMES of 5 July, the installation is manufactured by a small company in Scotland. It is no larger than a household washing machine.

The raw metal is loaded through a sealable hatch in the upper part of the unit; the continuous metal strip exists through a cooled graphite tool on the side. John Ewen, business manager of I.E. Ewen in Edinburgh, got the idea from his father and developed it to market maturity. In view of the small production

quantities, the Ewen casting furnace is primarily tailored for producers of precious metals who strive for an overseeable, precisely controllable operation in which the product emerges from the smallest possible number of steps in order to minimize loss of material. Mints are also interested in the process since coins can be stamped and embossed directly from the metal strip after a rolling operation.

In the production of precious metals, losses have always been a problem. The metal seeps into the various parts and joints of the smelting installation; and when dealing with small quantities where every gram counts, a significant difference can be observed between what is put in and what comes out. Since in making the smelting furnace aluminous cement is used, traces of the precious metal can be absorbed by the crucible lining. When melting is done in open crucibles, certain amounts of precious metals are lost by evaporation. Finally, in conventional smelting installations at least four men are required to operate the installation resulting in high personnel costs in addition to material costs. John Ewen believes that his Ewencast System precludes many of these disadvantages.

The dimensions of the Ewencast 100 were selected such that the system is attractive to businesses which produce or process smaller quantities of precious metals. The crucible holds about 100 kg. The melting temperature of up to 1,500 degrees Celcius is achieved through graphite heating elements. In a quarter hour 80 kg of metal can be melted. The crucible consists of antiwetting graphite which impedes losses. Stirring of the melt is accomplished by the injection of nitrogen. One man suffices for operating the furnace. At night and on week ends, a prewarming unit maintains a certain temparature level. Operating costs, according to Ewen, amount to one pound per hour. Interested parties can get further information from I.E. Ewen, 12 Davidson's Mains, Edinburgh.

9160
CSO: 3102/400

COMPUTER-CONTROLLED FACILITY DEVELOPED FOR OPEN-DIE FORGING

Frankfurt-Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
20 Jul 82 p 5

[Article: "Open-Die Forging With New Process-Computer-Controlled Facility"]

[Text] Aachen, 19 July--Open-die forging is a particularly flexible manufacturing process by which, with few and simple tools, products with a great variety of shapes and different sizes can be manufactured rather accurately. With the aid of open-die forging and the correct selection of forming speed and degree and forging temperature, clear improvements in material properties can be achieved.

To the forging operation falls the task of economically manufacturing variously shaped parts with special properties from a frequently imperfect rae billet. This is achieveable in the long term only if all conceiveable decision aids are available to the factory in transparent, useable form for planning and executing its forging task.

The present practice is generally characterized by empirical procedures. A further improvement in or shortening of the forging process (possibly with savings in the cost intensive intermediate heating), thus a quantitative and qualitative improvement, can only be achieved if the parameters and their interaction on the forming process can be even more precisely researched and taken into account in the future. After determination of optimal forging plans in the laboratory and transmission of these to the shop floor, the factory will be in a position to maintain specified process conditions.

Expansion of the Forging Domain

Forging aggregates for holding specific boundary conditions in the manufacturing process are in service as process-computer-controlled or process-computer-controlled-integrated forging facilities. Such installations have already been put into operation in several countries. With these installations, the forging of products with smaller dimensions or with more complex shapes can be more readily realized in the future. A series of shapes, for whose manufacturing closed dies are still required today, can under some conditions be manufactured in these facilities with relatively simple open-die forging tools. From this cursory presentation, several requirements for future research can be derived.

In this regard it makes sense to take note of the main connections which exist between the forming method (here forging methods) and the other disciplines required for producing forged parts, for example metallurgy, materials science and heat treating. Also, the aspects of energy and raw material supplies as well as workplace and environmental stressing, which are becoming of ever greater importance, can no longer be overlooked.

On this context, the research focus on open-die forging had already begun 5 years ago in the Institute for Plastic Forming at the Rhein-Westphal Technical University (RWTH) in Aachen. Within the scope of this program, practice related investigations are increasingly carried out whose results are regularly made available to manufacturers and forging-facility operators. The research programs have the following objectives:

--automation of open-die forging, including billet heating and cooling,

--computer-supported, optimized open-die forging (use of computers in optimizing open-die forging on a CRT and development of the control data) and

--enhancements of forging practice with respect to quality (tolerances and mechanical properties) and forming (production of almost-final-contoured forged parts and final products).

Thanks to the financial support of the German Research Society in Bonn-Bad Godesberg, the Technical Institute of RWTH, Aachen, was able to have a 6.3-mm forging installation designed, built and installed which can fulfill the extreme requirements of the listed research objectives. A basis for the unusual size of the press for an experimental laboratory resulted from the thought that in laboratory experiements, the more comparable the experimental equipment in size and function, the better the results it provides for practice.

In close cooperation with the Technical University's Institute, the firm SMS Scholoemann-Siemag AG, Duesseldorf and Hilchenbach, developed an experimental facility for massive forming which in general corresponds in size, construction and equipment to the open-die installati ns in production shops. The design of the press and the hydraulic, mechanical and electrical equipment for the press meets current requirements for universal application, simplified operation and maintenance, smooth and accurate functioning and economical operation. In the design high value was placed on the potential for tailoring the process speed to that required for optimal material behavior in each specific case.

The facility's furnace is a single-chamber furnace with natural-gas heating and achieves a maximum temperature of 1,300 degrees C. For loading and unloading billets, the furnace is placed transverse to and on the main axis of the press so that the manipulator can be used for the loading and unloading operation. For this the furnace itself is equipped with an appropriate transportation system.

The track-carried manipulator is used for holding the part during forging and for transporting parts to and from the press. The manipulator's feed motion during forging is accomplished via an oil-hydraulic cylinder. It possesses an electrohydraulic drive for travelling and for turning, lifting, pitching and side movement of the gripper. Operation is accomplished from the control

console of the foring press with manual remote control or automatic control in integrated operation with the press. The press is an above-floor design. The press frame is prestressed and consists of the following members: a support beam, two tension columns, two compression columns and a suspension beam. From the oversized diameter and generous material cross section of the compression columns results an extremely stable press (small elastic deformation) with respect to both axial and eccentric forces.

The more expensive construction of the prestressed press frame compared to a nonprestressed frame for the same machine weight pays off through better conditions for accurate work. The only alternative to this design would be the much heavier closed-casting frame similar to that of a rolling mill. The unit is designed for three types of operation: manual, automatic and programed. For automatic and programed operation the press, manipulator and furnace work as as integrated system. The associated electrical control units include, in general, the memory-programable control unit (SPS, PLC) and a digital process-control computer with a data display unit, printer and disk storage unit.

Simulated Optimization

In the design of the press and drive system, provisions were included for later addition for a closed-die forge and an extrusion press. For this, the frame had to be reinforced, an access for the extruders created and the drive and control units expanded. All prerequisites for the fulfillment of later research tasks in the areas listed were included in the plans so that expansions or modifications are possible without great expense in time and material. In addition the facility is already equipped with far more than the normal amount of measuring and recording equipment for the measurement and control of forces, displacements and speeds during forging or other forming processes.

Even though the experimental facility was constructed for versatile operation, the construction development of this facility has shown that the press itself is suitable as a prototype for a new generation of more economical open-die forging presses for use in the rough production environment of the foring shop.

With the test facility various forging processes will be investigated, especially with respect to further improvement of geometric and mechanical characteristics of the product. At the end of the current research program, it will be possible, among other things, to optimize a selected process on the CRT system, that is without the use of materials or tests. The press will be fully controlled with the values calculated in this manner. This is an objective which will have to take on greater and greater importance in forming technology if forming methods are to be optimized and materials better used.

The other goal is the purposeful tailoring of material properties such as strength and toughness. In this is to be seen one of the great tasks for future research and development in forming technology.

Through the fact that such an advanced forging installation is available, thanks to the financial aid of the German Research Society, at a neutral research institute--a technical university institute--which is not attached to any company, there exists for the industry involved the potential to accomplish the following in cooperative work with this institute:

--to optimize forging plans or to develop new plans for more complicated parts or qualities,

--to train personnel in the use of programed forging and

--to investigate problems without interrupting production.

9160
CSO: 3102/400

BRIEFS

BELGIUM'S FIRST INDUSTRIAL ROBOTS--According to reports from the Belgian trade press a company with 14 employees has produced Belgium's first computer operated industrial robot. The reports show that the Distribel Co (Verviers) has received orders from 25 industrial firms amounting to a total of 250 million Belgian francs. Several "Phoenix" prototypes are to be introduced at trade fairs in Leningrad in October and in Chicago in April 1983. [Text] [Leinfelden-Echterdingen DIE COMPUTER ZEITUNG in German 16 June 82 p 2] 12124

CSO: 3102/415

NATIONAL ASSEMBLY ADOPTS RESEARCH BILL

Paris AFP SCIENCES in French 24 Jun 82 pp 1-4

[Article: "Scientific Research Policy and Organization"]

[Excerpts] Orientation and Programmation Bill Adopted by National Assembly

The research orientation and programmation bill and the report appended to it were adopted on 23 June by the National Assembly, with 333 votes in favor and 147 opposed. Amendments presented by the special commission of the Assembly and the government or the majority contributed to restore a version of the text very close to the initial bill. The Senate majority (RPR-UDF [Rally for the Republic-French Democratic Union]) had indeed considerably altered--"emasculated" according to Mr Jean-Pierre Chevenement--the bill which had been submitted to it last month by the minister of research.

Highlights of the Research Orientation and Programmation Law

Let us recall that the bill which has just been adopted by the National Assembly defines orientations for research and technological development and determines their financial and technical programmation for the period 1983-1985.

The objective is to increase the share of the gross domestic product devoted to research and technological development expenditures from the present 1.8 percent to 2.5 percent by 1985. To do so, the bill provides that the credits made available by the government's civilian research budget will increase at an average rate of 17.8 percent per year, and the personnel employed in public research by 4.5 percent per year.

To achieve this goal, the government will rely on four lines of action:

- "Mobilization programs," a list of which will be drawn up yearly; their aim will be to associate the various research partners (public research organizations, universities, public enterprises, private enterprises and research centers) to attain a consistent series of national interest objectives.

- Increased credits for basic research, which will increase at an average rate of 13 percent per year, special attention being given to the realization of large scientific facilities.

- Policy orientations decided after consultations with the parties concerned (scientists, organizations and ministries, research users) for applied or finalized research.

- Finally, the pursuit of technological development programs in four sectors: electronuclear, space, civilian aeronautics, and the oceans.

These measures will be accompanied by organizational and structural reforms:

- The personnel statutes of the various research organizations will be brought into line. A reference statute representing a derogation to the civil service statute will be established to provide the personnel with more mobility in their careers. Also, job training will be developed.

- A new type of institution, "public institutions of a scientific or technological nature," will be created so as to standardize the statutes of public administration research institutions such as CNRS [National Center for Scientific Research] or INRA [National Agronomic Research Institute].

- A new and very flexible form of association, the "public interest group," issued from the "semi-public corporation," will also enable a more powerful public sector to associate with private companies for specific projects.

- Finally, the regional dimension of the research policy is stressed. A "consultative committee" will be created in each region. Working with the Regional Council, it will give its advice on all questions dealing with research and technology. All regional interest programs extending over several years will have to be submitted to that committee.

Adoption of the Bill to Be Completed By the End of the Month

The orientation and programmation bill voted after a "first reading" by the National Assembly should be permanently adopted by the end of the month, we have learned from official source.

Since--to quote a statement of the minister of Research published on 24 June--the Assembly "did again what the Senate had undone" by reestablishing the text of the government's initial bill, the bill must again go back and forth. Not too many times however, since it is now examined "after a declaration of emergency."

This procedure provides that, after a "first reading" by both assemblies, a joint commission, in which the National Assembly--which is in session today, 24 June--and the Senate have equal representation, shall meet, and this could take place as early as 29 June. Should the two assemblies still disagree, which is likely according to observers, the text adopted by the deputies would become law.

Thus, next July, "France will be endowed with a strategy and legal means adapted to the fundamental effort which should bring it to the third rank of the world's scientific and technological powers," to quote Mr Jean-Pierre Chevenement.

"The impetus provided by the national symposium on research and technology (which took place last January) can from now on be reflected in the lives of laboratories, enterprises and regions, thanks to the provisions of the new law," the minister added.

"Mobilization programs will orient our research effort during the next 10 years," research jobs will be "redefined," "new technical and scientific data valorization and dissemination missions" will be entrusted to research organizations, the management of which will be "made more flexible," "generalized cooperation" will be implemented between research and industry, and the regions will have to play an "active role."

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CSO: 3102/423

SAAB OPTIMISTIC ABOUT SUCCESS OF SF 340

Historical, Economic Background

Stockholm NY TEKNIK in Swedish 24 Jun 82 p 12

[Article by Fredrik Dhejne: "It May Be a Modern DC 3 a"]

[Text] ■■ On 27 October this year the first Saab-Fairchild 340 will roll out of the Saab aircraft factory in Linköping.

■■ It has been 36 years since a civilian plane of this size has been manufactured in Sweeden. Saab called it Scandia. It was one of many types that were to replace the DC 3 a.

■■ But there were only 18 Scandias for Saab. The DC 3 a lived on. Perhaps with the SF 340 there will be a real replacement for the first time.

■■ Saab and Fairchild will assemble 72 planes a year in Linköping. Nine hundred new jobs will be created and Saab can reduce its dependence on the military.

■■ But the admission ticket to the civilian market is high: Saab and Fairchild are paying 800 million kronor--and that is just the beginning.

The new plane that is now being put together in the assembly plants in Linköping and New York will fly on feeder lines and in regional traffic all over the world.

In the United States--which is the most important market--this plane is often called a "commuter." That is the civilian plane's most expansive sector. There is talk of a demand for 2,000 planes from now to the turn of the century.

Saab and its American partner Fairchild hope to sell at least 600 of these. That corresponds to a value of 18 billion kronor.

The cooperation between Saab and Fairchild is the first big joint project between an American and a European aircraft industry.

Fairchild is really mostly a military manufacturer. But through its subsidiary Swearingen Aviation it also has a big civilian aircraft sector.

Swearingen specializes in smaller passenger planes. It is also this firm that will market the new plane in North America and Mexico.

When Saab began to think about a suitable civilian project it was gradually realized that Saab could not cope with that on its own.

Big Demand for Commuters

Market studies showed that there is a big demand for a new commuter plane. It was also clear that at least half of the market is in the United States.

For that reason Saab contacted several American plane manufacturers. Of those questioned: Cessna, Piper, Beech, and Swearingen, only Swearingen gave a positive response.

In June 1979 Saab and Fairchild started joint technical studies. Saab was thinking about a high-wing, simple plane for short runways.

Fairchild for its part was working on a low-wing plane without short take-off capability.

In September the technical studies were put together and the present design resulted:

A low-wing relatively sophisticated machine with no short take-off capability.

Parallel to the technical studies the firms formed a joint sales company, Saab-Fairchild HB. That company will sell the plane everywhere except in the United States, Mexico, and Canada.

Economic responsibility is equally divided between Saab and Fairchild.

On the other hand, Saab has a larger part of the development and testing.

The body of the plane and the pilot's cabin are made in Linköping. The wings, fin, stabilizer, and motors are manufactured in the United States. Final assembly and flight testing are done in Linköping.

For Saab the SF 340 project means the break-through on the civilian market. It is 30 years since the last one.

From 1946 to 1948 Saab designed a two-motor propeller plane for 36 passengers and built 18 planes of that design.

Compelled to Stop

The plane was called "Scandia" and was used by SAS [Scandinavian Airlines System] among others. It became popular, but the state forced Saab to stop production.

The cold war was on, and Saab got an order for 600 J29 Tunnans. There was no room for civilian production.

Economically the SF 340 is a very big project for Saab. The project will create 900 new jobs, and what with the production of parts for the DC9 and the BAe 146, the aircraft division's military percentage will drop from 80 percent to 50 percent.

The investments are in the billion-kronor class. The new factory will cost about 200 million kronor.

Development, design, flight simulators, two test bodies, and two prototypes will cost 600 million kronor in round numbers. Later, when serial production gets under way, the investments will run much higher still. Several billion in material alone.

The magical "break-even" figure will be reached when about 200 planes have been sold. The 111 already sold mean that they are just over halfway there.

New Construction Techniques

Stockholm NY TEKNIK in Swedish 24 Jun 82 pp 12-13

[Article by Sven-Olof Carlsson: "Lighter With Glued Plate"]

> [Text] In the new Saab-Fairchild plane SF 340 large parts of the body and wings are glued together instead of being riveted in the conventional way. The gluing fastens the plates together into stronger and lighter structures than can be gotten by riveting.

Riveting is still used for fastening the plate panels to the framework and for making plate panels of especially complicated geometric form.

All large or single-curve plates are glued together. There are such plates in the cylinder that forms the central fuselage and in the large, almost flat wing surfaces.

Two plates 0.6 mm thick are glued together. Later, thin ribs are glued on them to give them greater rigidity. In the final assembling these plate panels are riveted to a framework of girders and form a cantilevered section of the fuselage or the wing.

Gluing is also used in the thinner structures of the plane, including the horizontal tail wing, the stabilizer, and all doors. Here two plates are glued together with an intermediate stiffening of honeycomb material.

For fastening the thin aluminum plates together into the 1.2 mm shell of the SF 340 a new gluing technique is used, the Pabst method. It was developed in a project directed by the American air and space administration NASA. For air and space projects NASA did extensive studies of existing gluing techniques.

New Method Developed

Saab-Scania was among those consulted in the research. NASA decided that the prevailing British "Redux" method needed to be replaced.

The Pabst method was developed. It combines Boeing's technique for preparatory surface treatment, anode oxidizing with phosphoric acid, and McDonnell-Douglas's technique of applying a primer, glue, and hardening the glue in a tempering furfurnace.

Considerably More Elaborate

Both Saab-Scania and Fairchild used the Redux method earlier. But they have now adopted Pabst as a technique for getting light, strong structures. The technique is automated to a great extent and has greatly reduced manual handling. It requires fewer glue experts and makes it easier to meet the work environment requirements.

The Redux method was considerably more elaborate, with its phenol-based glue in liquid and powder. The film gives an even thickness of glue. Saab is counting on it that Pabst will be the aircraft manufacturers' standard method in the future. It simplifies certification of future Saab-made civilian planes and contract jobs with other manufacturers.

The gluing process is as follows:

- The plates are accurately fitted together,
- The plate surfaces are oxidized with phosphoric acid (the plates that are not glued are oxidized with chromic acid),
- Epoxy primer for the glue is sprayed on, evaporated, and dried, and the plates are cooled,
- A coating of lime is put on the plates and stringers,
- Plates and stringers are properly assembled,
- The whole is rolled on a cart into an autoclave for tempering the glue,
- Fine touch-up, milling the edges,
- Inspection of panels and test pieces; the test pieces are subjected among other things to destructive testing.

Gluing in Several Steps

For large panels such as those in the sides of the fuselage the gluing is done in several steps.

In the SF 340 the circular form of the fuselage with only tensile stresses makes for simpler calculation and testing of the strength of the panels, aside from the advantages the design has otherwise.

New Materials

Stockholm NY TEKNIK in Swedish 24 Jun 82 p 13

[Article by Fredrik Dhejne: "Fuel Economy and Easy Maintenance"]

> [Text] The Saab-Fairchild 340 is a plane of conventional design. But to get low fuel consumption and cheap maintenance the plane is manufactured with advanced production methods and partly of new material.
>
> When it was being designed it was decided that large parts of the body and wings would be glued together for low weight and high strength.

The body is built in three sections: Nose with pilot's cabin, cylindrical pressure cabin, and tail section with fin and stabilizer (tail wings).

The central section is made up of four large panels that are riveted together. The panels in turn consist of alloyed aluminum plates that are glued togehter.

The body is reinforced with riveted frame and longitudinal glued reinforcements called stringers. Ventilation system, batteries, and hydraulic lines are placed outside the pressurized cabin. This simplifies maintenance. In addition, the body does not run the risk of being damaged by leaks from the hydraulic systems or the batteries.

In the wings the same technique is used as in the body. They are built up around two longitudinal beams. On the beams lie plate panels (double glued plates) that are riveted to the beams and transverse framework. Here, too, the panels are reinforced with glued stringers.

The wings are shaped to give extra-high lifting power and low resistance. This is achieved by making the wings thinner and narrower than a more conventional design.

Hot and High Airports

Aerodynamically the plane is designed to give the best possible performance at hot and high-altitude airports.

The two fuel tanks are in the wings. The engine nacelles, with the main landing gear, are also on the wings.

The tail fin and stabilizer (tail wings) are made of glued panels and aluminum honeycomb structures. The doors are also made in the same way.

Compositions of aramide fibers and epoxy are used in the cowling around the attachment of the wings to the body, in the rudder, and in valves. The nose and tail cones and the cabin floor are made of glass-fiber laminated plastic.

The motor is a General Electric CT7-5 turboprop. It was chosen primarily for its low fuel consumption. General Electric believes so much in its motor that

it promises to pay the airlines for all fuel that exceeds the guarantees.

The motor was developed from a helicopter motor. That is a great advantage, according to Saab. The core of the motor, the so-called gas generator, has been flying for a long time and demonstrated its quality.

The motor is designed in modules to simplify maintenance. This means among other things that parts can be replaced without the motor's needing to be taken out of the plane.

Plastic Propeller

The plane will not be equipped with any APU taxiing unit. Instead, to provide current and heat on the ground one motor will be run idling with the propeller braked.

The propeller is made by the English firm Dowty Rotol. Like the wings, it is designed thinner to give high lifting power and low air resistance. Especially in take-offs and while climbing.

The propeller blade is built up around a frame of carbon-fiber plastic. In the inside of the frame there is a layer of polyurethane foam. The surface of the blade consists of glass-fiber-reinforced epoxy plastic. The blade is mounted on a duralumin boss.

The pilot's cabin contains computerized flight instruments and picture screens with color reproduction (cathode ray tubes, or CRT).

The instruments and flight electronics are supplied by the American firm Collins.

The system is digital and includes a test function that continuously monitors the plane. In any trouble an alarm sounds and the pilots get help in finding the trouble and taking countermeasures.

The warning system is based on the principle "black is O.K." This means that when the plane is flying as usual and all systems are functioning as they should, no lamps light up. The warning panel is thus black.

The pilots who fly the SF 340 will normally fly up to five or six runs per work shift. Flight safety, therefore, demands a good working environment. The new flight electronics with data screens is a part of that.

But also the fact that the cabin is roomy and easy to get in and out of. The instruments and seats are so placed that the working position will not be tiring or uncomfortable.

The plane will most often fly at low altitudes in areas with heavy air traffic. For that reason the windows in the pilot's space are made extra large for the best possible visibility.

Could Replace DC 9, F 28

Stockholm NY TEKNIK in Swedish 24 Jun 82 p 14

[Article by Fredrik Dhejne]

[Text] Saab-Fairchild's new plane SF 340 has Linjeflyg worried. The plane has both speed and range to be able to replace the DC 9 and the Fokker F 28 on short runs.

Besides that, the SF 340 is so quiet that it can fly at Bromma. That makes for new struggles over the future of the airport.

"The 340 is no threat to us as long as it is used for what it is built for. But we are worried that it may be used in a different way."

That is what Jan-Åke Jonsson, planning chief of Linjeflyg, says. He says the SF 340 is a fine plane, but that it should not be used to replace traffic that is carried today by the Fokker F 28.

"If anybody gets to fly from Bromma--there has been talk about Bromma-Karlstad --then we shall have to close down corresponding lines from Arlanda."

Jan-Åke Jonsson emphasizes that if the F 28 is replaced at, e.g., Karlstad, that does not release any resources for LIN [Linjeflyg]:

"The flight schedule is so constituted that there will not be a whole plane left over. It will only mean that we have gaps in the schedule. Then the plane will be sitting on the ground longer, and that is not efficient utilization."

He also says that Linjeflyg has studied the possibilities of "salvaging" traffic at Bromma:

"We were counting on the Dash 7, among others, but our calculations showed that dividing the traffic between Bromma and Arlanda would result in annual losses of about 100 million kronor."

At LIN it is considered that it will be best if the SF 340 is introduced on the lines that are flown with Twin Otters today. LIN prefers that the present assignment of rôles among SAS [Scandinavian Airline Service], LIN, and Swedair remain unchanged.

One change that would certainly be accepted would be for LIN to be allowed to take over SAS's domestic traffic in Sweden. But nobody is saying that outright.

Must Have Bigger Planes

At Swedair, which has bought 10 SF 340's, it is felt that the worry about competition is exaggerated:

"This fear that the SF 340 will take traffic away from LIN is exaggerated. There is hardly a one of Linjeflyg's long flights that can be replaced with the 340.

"Their lines have too big a base for traffic with that type. We should have to fly in convoy with them, and that is not profitable," says Carsten Lundahl, marketing chief at Swedair. He says that what is happening now is a natural development upward:

"We are moving up to a higher level, just as in a few years Linjeflyg will presumably have to replace the F 28 with a larger plane."

Carsten Lundahl says that Swedish plane fares are so low that the costs make it necessary for a plane like the Twin Otter to be fully occupied every time for traffic to continue.

"The limit for our profitability is a plane with a capacity of 26 passengers. Then if we have 60-percent occupancy we can just cover our costs."

It is these calculations that are behind the purchase of the SF 340. Certainly the SF 340 carries 34 passengers, but with an average of ca. 22 seats occupied the costs will be covered. Then if the remaining seats are sold the profitability increases greatly.

For the future Carsten Lundahl believes that Swedair will continue as now to fly certain lines for LIN and SAS side by side with its other activities. (Taxiplane service and target-towing for Defense.)

He also believes that there is a potential for the SF 340 in traffic from towns in southern Sweden to Copenhagen.

"There are no talks with SAS under way about our flying on inter-Scandinavian lines, but it is conceivable. We also hope that we can get a line of our own," says Carsten Lundahl.

At the Swedish Civil Aviation Administration, too, it is believed that the SF 340 is well suited for regular flights at short distances.

"We view the development positively," says Anders Sviden, of the planning section of the administration.

"The shortage of good planes has been a retarding factor. There has been a vacuum in that no planes were developed for secondary traffic."

Anders Sviden points out that the SF 340 is in the same size class as the legendary DC 3, and that it is perhaps true that the latter has had no real successor until now.

Anders Sviden believes that the SF 340 has a broader field of use than simply as a feeder plane:

"It can replace certain international jet traffic. The shorter the distance the more profitable a plane like the SF 340 is."

In Scandinavia there are several suitable lines, and he says that in any case in Sweden the Civil Aviation Administration is more inclined than formerly to grant concessions to firms other than SAS.

Should Be Controlled by Demand

Jan Hull, head of the sales company Saab-Fairchild HB which is marketing the plane, says that the SF 340 has a bigger base than the sales show.

He also says that there is a partially artificial division of the domestic air traffic in Sweden.

"It should be that the demand for travel determined the service offered."

Jan Hull points out that Östergötland, for example, is very poorly provided with airline service:

"If I have to go to Copenhagen I do not want to fly via Stockholm, and from Norrköping there are too few flights.

"More frequent flights would generate more passengers, and SAS has to make a stop at Copenhagen to fill up its DC 9's." (Västerås—Norrköping—Copenhagen and return.)

Jan Hull says that a smaller plane like the SF 340 could meet this demand and make more flights for the same cost as a DC 9. He thinks the trend is in the right direction:

"With the new management in SAS there are good prospects for a realistic view of how Scandinavian air traffic policy should be formulated."

Liberal in Moderation

On the other hand, Jan Hull is dubious about a total liberalization of air traffic policy like that in the United States (deregulation).

"There is still need for a form of controlled liberalization. It is a little too easy to borrow money to start small airline companies. A certain guidance is necessary," says Jan Hull.

SAS also draws the same picture:

"We are open to cooperation with other airline companies. But we do not see that butterfly planes are in anybody's interest. It is a little too cheap to buy a smaller airline company," says Krister Westerdahl of the commuter flight division of SAS.

He is not afraid of competing SF 340 traffic. But he says it is important for regional air traffic and feeder lines to be adjusted to the whole airline system.

Krister Westerdahl, too, believes that certain jet traffic can be replaced with smaller planes.

"I believe that it might be better to use SF 340's on a lot of runs. But we do not yet know how it will work out.

Facts About the Saab-Fairchild 340

The SF 340 is a small passenger plane with 34 seats. The plane is designed for short distances and as a feeder plane between smaller and larger cities. The plane is also produced in an "executive version" with fewer seats and expensive fittings.

External dimensions:

Length	19.72 meters
Height of fin	6.87 meters
Wingspread	21.44 meters
Track width	6.71 meters

Internal dimensions:

Passenger cabin (length)	10.57 meters
Passenger cabin (width)	2.16 meters
Ceiling height	1.83 meters

Weights:

Empty weight	7,194 kg
Maximum take-off weight	11,794 kg
Maximum landing weight	11,567 kg
Fuel capacity	2,676 kg
Maximum payload	3,239 kg

Range, at economical speed with 34 passengers @ 85 kg + 315 kg of baggage: 1,110 km. Passengers 34, crew 3, maximum speed 508 km/h, most economical speed 400 km/h. Price ca. 30 million kronor ($4.75 million).

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CSO: 3102/433

LUFTHANSA EXECUTIVE DISCUSSES AIRCRAFT NEEDS FOR 80'S, 90'S

Gelsenkirchen AEROKURIER in German Jun 82 pp 669, 674-675

[From an address, "Opportunities and Restraints," given by Reinhardt Abraham, member of the board of Lufthansa, at the Seventh Day of European Aviation Pioneers in Toulouse at the beginning of May]

> [Text] The increasinly close involvement of global air traffic in world economic development offers opportunities and restraints. This applies equally to periods of growth and recessions--although in different degrees. Dipl.-Ing. Reinhardt Abraham, member of the executive board of Lufthansa, examines in the following article the connections that exist, the opportunities available and the overall conditions that could exercise some limiting effect. Even a pessimistic look shows that global air traffic will remain a growth industry for this century.
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> The article itself is the printed version of a presentation by Reinhardt Abraham on the occasion of the Seventh Day of European Aviation Pioneers, which was held at the beginning of May in Toulouse in honor of Carl August Freiherr von Gablenz.

Equipment For The 1980's and 1990's

If we now turn our attention from the problems of the infrastructure to the equipment for global aviation at the end of the 20th century, the furnishings of the new generation of aircraft, A310, Boeing 757 and Boeing 767, with their fully integrated electronic guidance and navigation systems and the ability to present information on screens, may appear to be almost ahead of their time.

I would like deliberately to exclude the question concerning the areas and directions in which we might expect technological progress in civilian aircraft construction, since I have already stated my opinions on several occasions elsewhere. In the opinion of some, dramatic progress in aircraft construction is no longer possible and can hardly be expected in the next 20 years. I cannot agree with this formulation; basically it stands up to only superficial scrutiny. What we are experiencing with the new generation of aircraft on the flight deck, the innovations that we have available in different aircraft systems and in the area of materials and constructions methods, are technological revolutions--at least apparent to the pilot and the engineer. Otherwise they would hardly cost so much.

/The air travel industry will, therefore, place orders for a substantial amount of new equipment, as soon as it is out of its recession. Although many airlines today do not know how they will find the money, it is already certain that in the next 10 years about $100 billion will have to be spent to replace out-of-date equipment and to be ready for a growth in traffic between 5 and 6 percent. A growth rate like this, clearly higher than the expected increase in the world gross national product, does not seem unrealistic in the light of increasing global economic affiliations, demographic developments and the constant need to acquaint oneself with foreign countries and people./ [in boldface]

To meet the airlines' needs, further aircraft development is needed, such as the much-discussed 150-seater for short-and medium-range traffic and an aircraft with 200 to 225 seats for long intercontinental routes. Naturally, the market potential for the first type is much higher in the long term. But the conditions for the success of a project like this are extremely difficult, given today's circumstances:

--To achieve good sales figures from the outset, a new 150-seater must be economically clearly superior to the well established Boeing 727--and not simply in fuel consumption, but on the bottom line. In particular because of the high capital costs of the new aircraft, this precondition has not yet been met, even if we continue to include above-average increases in fuel prices. So, market potential remains restricted initially to fleet expansion in this capacity class.

--An optimal engine must be available, which incorporates the newest technology and is adequately tested for a twin-engined aircraft. There are difficulties here as well.

--The airlines must be prepared and financially able to place prompt orders for this type of aircraft, in adequate numbers. The high development costs for the fuselage and the engines require an adequate rate of production without serious gaps in employment, with a comparatively low return per unit.

When will the airline industry have achieved the necessary prosperity again?

--As soon as the conditions mentioned have been fulfilled, extremely intense competition will flare up in this class of aircraft. Economic success will come to the manufacturer who offers a superior product consonant with the ability of the industry to invest. So it makes complete sense to wait for some time in order to utilize further technological advances to an even greater degree.

Proper "timing" will play a key role in this project.

/Summing up, it is my opinion that development of the European A320 Airbus should be pushed ahead, until this design is actually ready for the market. By "market readiness" I do not just mean winning a minimum of initial orders, but the prospect of sustained saleability on the basis of an economically attractive, internationally competitive product. It is of no importance for this evaluation whether Lufthansa will be among the "launching customers" in this instance, or not./ [in boldface]

As is known, a "small" long-range aircraft project, known as TA 11, is competing with the A320 to be first in time--and it is considerably behind, according to the current state of affairs. I am also not overlooking the difficulties here. The market potential, in numbers of aircraft, will probably reach scarcely 40 percent of the short-range 150-seat aircraft. The figure is higher in terms of return.

There is a special problem here in that the traditional large initial orders (particularly the U.S. trunk routes) are largely eliminated in this market. On the other hand, customers for a TA 11 would be found among the 100 medium-and small-sized airlines for whom a "Jumbo" is out of the question or who could not live just with the Boeing 747. This is a laborious but perhaps rewarding piece of business for the marketing department of an aircraft manufacturer.

The majority of these airlines do not pursue any long-term planning and they buy what is available at affordable prices on the market. So it requires a certain amount of courage to rely on this type of prospective customer--a problem that must not be underestimated. Only thorough market analysis can help here.

Looked at from the other side, the TA 11 project offers chances that have to be analyzed thoroughly:

--For the airlines there is the opportunity for a greater number of direct flights, higher frequency of flights with all the accruing advantages, an overall better profit-taking from the market, and in many cases the opening and/or maintaining of long-distance traffic.

--For the aircraft manufacturer Airbus Industrie and all the supplier companies, it means penetration of the complementary long-range market, sensible expansion of the family design concept with a further lowering of costs in all component groups and systems that do not require any new development.

--An opportunity for diversification of risks for manufacturer and customer. Lufthansa, for example, would have reservations about making its entire short-range fleet dependent on Airbus Industrie and its long-range fleet on Boeing.

--The dropping of the Lockheed 1011, the uncertain fate of further development of the DC-10. The necessity of replacing this model aircraft after 1988 at the latest, a move in which a smaller-capacity aircraft tends to offer advantages.

--Timely availability of modern engines, which have been tested and which can also be used in other types of aircraft.

--The exploitation of a promising market niche, to fill which the main competitor, Boeing, does not possess a similarly favorable financial or technical point of departure.

Decisions about new projects in aircraft and engine construction will doubtless become more and more difficult and will require increasingly more thorough preparation.

High development costs mean high financial risks. There must be no doubt in anyone's mind that without state guarantees and additional subsidy measures, healthy competition between manufacturers can no longer be assured. If this requirement is not taken into account, the danger of monopolization in the airline industry exists, with all the negative consequences for price development in aircraft construction, which is already once more threatening to negate the fuel- and cost-saving properties of new designs.

The airline companies will have to continue to plan their buying policy with a view to opposing any monopolization, even in partial markets.

Supersonic Travel?

In the past, looks ahead at air travel at the turn of the century nearly all contained an element of science fiction: supersonic, hypersonic, space travel . . . . Barely 10 years ago, a major experienced airline of U.S. origin was accepting bookings for its first scheduled flight to the moon and was exhibiting a model of its first "space ship" throughout the world. In the meantime, oil crises and deregulation have directed our thinking onto quite different paths, and there are even signs of a renaissance of the turboprop aircraft--at least for short hauls.

Still, I am convinced that we will not stop at Mach 0.8 in intercontinental air travel. Travel times between 8 and 24 hours continue to challenge the mind of the inventor. A second-generation supersonic aircraft must be financeable, supersonic flight must be affordable. Development will, therefore, be pushed ahead with extreme caution and strictly according to economic viewpoints, with the key role being assigned to the engines. Range, fuel consumption, environmental pollution and maintenance costs will determine progress and they represent a second sound barrier which still has to be broken.

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CSO: 3102/431

BRIEFS

FOKKER 'FXX' MARKET STUDY--Following the cancellation of the joint project for a 150-seat airliner with McDonnell Douglas, Fokker is now studying new possibilities for an independent airliner project. Under discussion is a 100-seat machine which could fill the gap between the current Fokker F-28 and the planned 150-seater. The studies at Fokker are still at a very early stage. For example, it is still undecided whether the new aircraft will be powered by turboprop or jet engines. Fokker is also still undecided about the economical cruising speed at which the new aircraft is eventually to fly. The objective of the project is not so much high cruising speed as a highly economical alternative to aircraft in the 100-seat category. With its market studies for the 100-seater, Fokker is continuing its earlier work for the F-29 project, a 132-seat airliner that did not meet with the expected response in the market. The new study for the 100-seater goes under the project designation FXX at Fokker. If market response to the Fokker FXX project is positive, final realization of the plan will probably still depend on whether the Dutch are able to find another strong manufacturer as a partner for this program. On the other hand, it is not completely out of the question that Fokker will participate in the program for the small Airbus, the A320, if the starting signal is given in the near future at Airbus Industrie for this 150-seat airliner. [Text] [Gelsenkirchen AEROKURIER in German Jun 82 p 660] 9581

AIRCRAFT ENGINE CONSORTIUM--There has been some movement in the hotly debated question concerning a new engine for a 150-seat airliner--such as the Airbus Industrie A320. At the end of May, Rolls-Royce, Pratt & Whitney, MTU and the Japanese Aero Engine Companies announced that they were beginning formal discussions concerning the joint development and production of a suitable engine. Joint agreement should have been reached by midsummer, defining the performance data of the engine and the form of possible cooperation. An engine suitable for one of the proposed 150-seaters could be available at the end of 1987 or the beginning of 1988. General Electric and Snecma are competing with the consortium, using further developments of the CFM56, which is now in regular service. [Text] [Gelsenkirchen AEROKURIER in German Jun 82 p 660] 9581

3102/431

END

JPRS 81841

24 September 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 121

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JPRS 81841

24 September 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

No. 121

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FRENCH STUDY INCREASED FUNDING FOR BIOTECHNOLOGY RESEARCH

Paris LES ECHOS in French 22 Jun 82 p 2

[Article by Jacqueline Mattei: "500 Million Already Allocated and 1.2 Billion Under Consideration"]

[Text] A year ago, biotechnologies were added to the list of areas handled by CODIS (Committee for the Development of Strategic Industries). To date about 10 projects have been approved, representing an investment of Fr 500 million over the next 3 years. The beneficiaries are expected to be small to medium-sized industrial enterprises and even some companies now being formed. Among the projects approved, we should mention Immunotek's monoclonal antibody project aimed at expanding upon the research conducted in this area by INSERM [National Institute of Health and Medical Research].

CODIS is now studying the "heavy" projects that would involve the large companies, such as Rhone-Poulenc, Roussel-UCLAF, and Sanofi. In all, the projects will entail investment outlays of some Fr 1.2 billion. The manufacturing firms have the task of bringing order to the "biotechnologies" as well as reorganizing holdings which have been scattered among various divisions of the respective companies.

Rhone-Poulenc, for example, as part of a development contract now being negotiated with the Ministry of Industry, is seeking rather substantial funding for its bioindustrial activities. The Rhone-Poulenc group's projects include lysine, as well as a possible entry into seeds.

Finally, CODIS is making every effort to assist the Pasteur Institute in the establishment of a collection of microbial cultures.

The "new" bioindustry (that is, anything besides classical information products such as wine, beer, yogurt, etc.) represents a worldwide volume of Fr 90 billion worth of business. For its part, France does Fr 6 billion worth of business in this area: Fr 3 billion in the health sector (vaccines, antibiotics) and Fr 3 billion in the agro-food sector (food and feed additives, amino acids). France's goal is for growth to take place at a rate of 15 percent per year in volume, that is, somewhat faster than the world market (10 to 12 percent per year).

This policy on bioindustry has two major axes:

- To develop to the maximum degree possible those activities in which France already holds an advantage. In the forefront is immunology. France is developing second generation vaccines, meaning use of a purified viral antigen instead of attenuated whole virus.

The Pasteur Institute is making preparations to market a new hepatitis B vaccine on this principle in the near future. Also, a number of months ago, it achieved the complete synthesis of the tetanus toxin, which may lead to a new product.

- To compensate for the French industry's shortcomings by means of international agreements. This applies especially to antibiotics, concerning which France and Japan is holding talks--which will undoubtedly take some time to complete. Other sectors where France will try to catch up include amino acids and seeds (besides Rhone-Poulenc, other companies including SNEA [National Company for the Promotion of Agriculture], are studying projects in this area).

For the manufacturing firms, however, there is at least one curb on the investments in biotechnology: short-term profitability. Paradoxically, confirms Christian Langlois-Meurinne, director for chemical industries at the Ministry of Industry, "concrete projects are less plentiful than is the willingness of the government to aid them."

9828
CSO: 3102/368

BRIEFS

GENE STRUCTURE DETERMINED--Prof. B. Jordan's team at the Marseille-Luminy Center for Immunology, INSERM-CNRS [National Institute of Health and Medical Research, National Center for Scientific Research], has just announced the first complete structure of a gene coding for a human histocompatibility antigen. Their work, carried out in collaboration with Philippe Kourilsky's group at the Pasteur Institute in Paris, culminated in isolating and determining the complete chemical structure of a gene coding for a human class I histocompatibility antigen. The most difficult step in the program was to obtain a "probe," a partial copy of the gene, which was obtained from the messenger RNA which is translated in the cell to give the corresponding protein. This step is difficult in cases where the messenger RNA in question is not very abundant in the cell, as is true of the messenger RNA's coding for the histocompatibility antigens. The work of Kourilsky's group led to a complete determination of the structure of this gene, that is, finding its sequence: the linear arrangement of nucleotides (the basic units of DNA) which make up the gene and whose order determines the characteristics of the protein whose synthesis it directs. The complete sequence, which comprises 4,100 nucleotides, has recently been published in the PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES. It represents the first complete sequence of a human histocompatibility gene. [Text] [Paris INFORMATIONS CHIMIE in French May 82 pp 130-131] 9828

CSO: 3102/364

NORDIC RESEARCHERS DEVELOP CAD/CAM SOFTWARE

Stockholm NY TEKNIK in Swedish 24 Jun 82 p 3

[Article by Hans Werner]

[Text] Nordic researchers are "selling off" research results intended for Scandinavian industry.

These results are from computer work for the development of CAD/CAM programs, i.e. programs for computer-aided design and manufacturing.

Last week negotiations were held in Stockholm to discuss contracts. Project leaders from the institutes of technology in Sweden, Finland, and Norway are working together to develop programs in this area.

Representatives of the American-based international foundation Cam-I (Computer-Aided Manufacturing International, Inc.) are on the other side of the bargaining table.

Proposal Ready

The Nordic researchers do not intend to sell the actual software they have produced. According to the proposed contract, however, they are prepared to release detailed information to foreign companies on the basic research behind the software.

The proposed contract would make documentation of the joint Nordic GPM (Geometric Product Models) project available to Cam-I members. These include most of the world's leading companies in the United States, Western Europe, and Japan.

After the negotiations in Stockholm last week, the Cam-I management is prepared to sign a contract in mid-July. The Nordic project leaders, on the other hand, believe they will be ready to sign an agreement in mid-August.

Legal Problem

It is doubtful, however, that this will possible. According to civil engineer Torsten Kjellberg, who is the GPM project leader at KTH (Royal Institute of

Technology) in Stockholm, the Nordic Industrial Fund, which is financing the project, is examining the question of who actually owns the GPN results. This is being done in conjunction with the STU (Board for Technical Development) legal advisor. This is because after 1 July the Board for Technical Development will begin financing the project and will be primarily responsible for the further development of the GTM project.

Discussions

"We believe in international discussions," said Torsten Kjellberg, who stated the researchers' basic position on the joint project. "We cannot go into the same degree of detail in our discussions with Cam-I, however, as we do with Swedish industries. In addition, Swedish companies have access to computer programs at cost."

Nordic Lead

The idea behind the Nordic GPM project is to develop advanced computer-aided design so that Nordic industries can take the lead and gain a competitive advantage.

One complicating factor is that it still is difficult to obtain legal protection for computer programs. According to prominent Swedish lawyers involved in this area, international legislation is one possible solution.

So far, however, no international regulations and no Swedish laws provide full protection for the originators of computer programs. In the United States, on the other hand, protection is available that goes beyond copyright protection. There computer programs can be protected almost at the level of a patent.

Shelved

At the international level, the question of protecting computer programs was taken up by WIPO, the organ of the United Nations that deals with the Bern Convention. Due to a lack of resources, however, the issue was shelved in 1983.

This displeased countries such as France, Japan, and the United States, according to Erik Tersmeden of the Justice Ministry. For this reason, they have turned to another United Nations organ, UNESCO, which handles world conventions on copyright ownership.

Now the danger is that the two international organs will compete over the issue. From the Swedish standpoint, it would be preferable for one international organ to be responsible for the problem.

Retain Protection

While the lawyers continue their studies, the researchers are waiting with interest to see how they can both cooperate on the international level and, at the same time, protect their computer programs.

For Nordic industries that do not believe it is economically justifiable to join Cam-I (at a cost of $10,000), the danger is that they will not profit as much as they should from the impressive GPM project.

9336
CSO: 3102/436

MATRA-HARRIS PROPOSES CMOS UNCOMITTED LOGIC ARRAYS

Paris MINIS ET MICROS in French 5 Jul 82 p 13-14

[Unsigned article]

[Text] Matra-Harris Semiconducteurs (MHS) is offering uncomitted logic arrays with its CMOS technology, a technology that has already proven itself in memory manufacturing. Three circuits have been announced: MA 0400, MA 0800, and MA 1200, with 400, 800, and 1200 gates, respectively. Circuits with 2000, and eventually 5000, gates are planned.

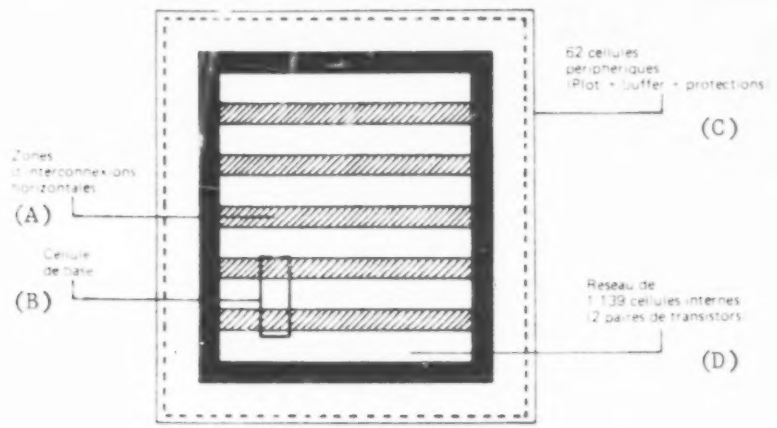


Figure 1. Organization of the 1200-gate CMOS array.

Key: (A) Horizontal interconnection zones
(B) Basic cell
(C) 62 peripheral cells (plot+buffer+protections)
(D) Array of 1139 internal cells (2 pairs of transistors)

Gate specifications

Caractéristiques techniques
— consommation inférieure à 100 µW/porte
— fréquence de fonctionnement 30 MHz (typ) (A)
Temps de propagation/porte (B)

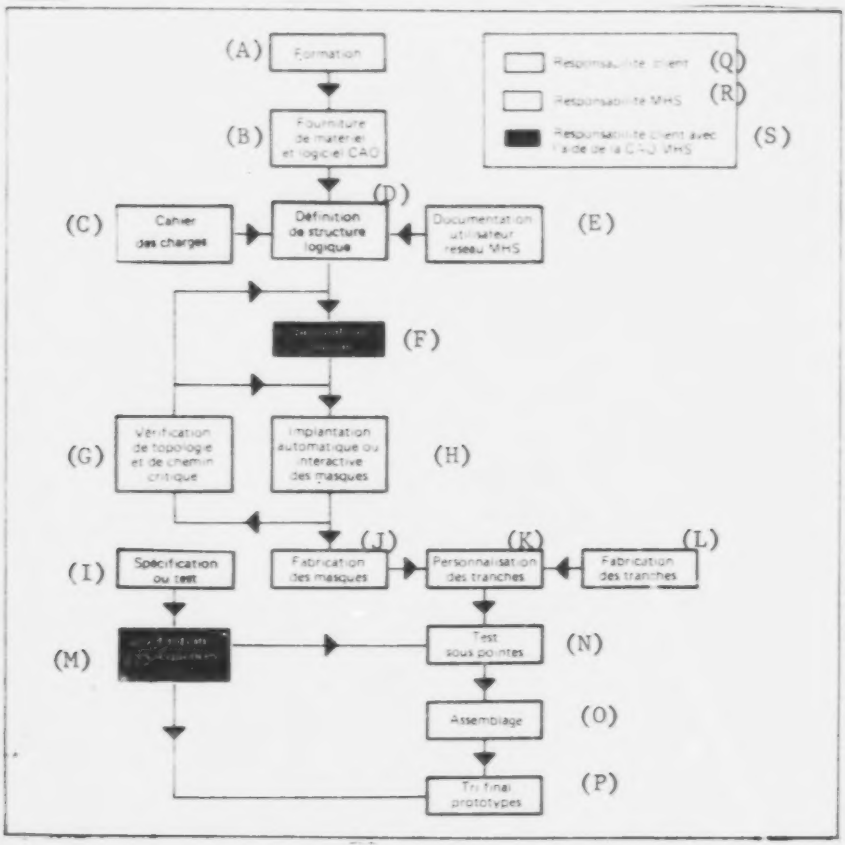
Type	Sortance = 2	Sortance = 6
Inverseur	2 ns	4 ns
Porte NOR	4 ns	6 ns
Porte NAND	2 ns	4 ns

Maximum ratings	(C) Caractéristiques électriques à 25°C					
	Paramètres	Descriptions	Conditions	Min.	Typ	Max.
(D) Alimentation 5 V ± 10 %	V_{OH}	niveau haut de sortie (G)	IOH = 500 µA	2.8 V	4.5 V	
	V_{OL}	niveau bas de sortie (H)	IOL = 3.2 mA		0.2 V	0.4 V
(E) Température stockage — 65 °C à + 125 °C	V_{IH}	niveau haut d'entrée (I)	Vcc = 5 V ± 10 %		1.5 V	2.2 V
	V_{IL}	niveau bas d'entrée (J)	Vcc = 5 V ± 10 %	0.8 V	1.5 V	
(F) Température fonctionnement — 55 °C à + 125 °C	t_{pd}	temps de propagation moyen (K)	inverseur sortance 2 + 400 µ M (M) connexion		2 ns	
	F	fréquence de fonctionnement (L)	bascule D en diviseur par 2 (N)		50 MHz	

Key: (A) Technical specifications : consumption less than 100 microW/gate
operating frequency 30 MHz (typ)
(B) Propagation time per gate
Sortance = fanout
Inverter, NOR gate, NAND gate
(C) Electrical characteristics at 25 degrees C
(D) Supply
(E) Storage temperature
(F) Operating temperature
(G) Output HIGH voltage
(H) Output LOW voltage
(I) Input HIGH voltage
(J) Input LOW voltage
(K) Average propagation time
(L) Operating frequency
(M) Inverter fanout 2 + 400 microM connection
(N) D-type flip-flop in divide by 2

Figure 1 shows the organization of a 1200-gate array. It consists of 17 rows and 67 cells, each cell being composed of two transistor pairs, to form 1139 internal cells. Input/output is provided by 62 input, output, or input/output cells.

Circuit development on logic array



Key:
(A) Training
(B) Supply of CAD equipment and software
(C) Specifications
(D) Definition of logic structure
(E) User documentation MHS array
(F) Logic simulation
(G) Verification of topology and critical path
(H) Automatic or interactive mask implantation
(I) Specification or test
(J) Mask fabrication
(K) Wafer personalization
(L) Wafer fabrication
(M) Definition of test sequences
(N) Probe testing
(O) Assembly
(P) Final prototype testing
(Q) Customer responsibility
(R) MHS responsibility
(S) Customer responsibility with MHS CAD assistance

MHS has developed a selection of elementary functions (AND, NAND, NOR logic gates, flip-flops), complex functions, (counters, registers, and so on), and input/output functions. The inputs are TTL- or CMOS-compatible, and the outputs TTL-compatible. The arrays are expected to replace 15 to 30 conventional circuits.

Five packages are possible:
Dual in-line ceramic package;
Same package in plastic;
Leadless chip carrier ceramic package;
Electrically tested chip place in a carrier circuit;
Electrically tested and cut slice.
The packages have 16 to 64 pins, providing an input, an output, a bidirectional input/output, and a supply connection.

The attached table presents some gate specifications. The speed of the gate can be selected as a function of the necessary fan out, from 2 to 6 ns for a fan out ranging from 2 to 6. A D-type flip-flop can typically switch at 50 MHz.

As for all uncomitted arrays, a close collaboration must exit between customer and manufacturer. Figure 2 shows the circuit fabrication sequence, as well as the respective responsibilities of the customer and of MHS. The figure also points out the importance of the customer's responsibility for logical simulation of his product (verifying that the proposed design properly satisfies the desired functions), and for establishing test sequences to test the circuit.

MHS plans a CAD (computer-aided design) center in Nantes, accessible through the network (at 2400 baud), that includes two Harris 550 computers; a VAX 780 computer for simulation, mask generation, and verification; two Calma graphic editing systems; as well as tracers and graphic terminals. The company has software for logic simulation, for interactive or automatic mask generation, and for electrical and topologic mask verification. An average of 13 to 15 weeks are needed to obtain circuit "prototypes" after the first data is introduced into the CAD system.

Nantes 8086's

The first batch of 8086's came off the line on 20 June at the Nantes plant of MHS. Produced in HMOS version with Intel technology (the agreements between the American company and the Matra subsidiary are well known), these first 16-bit Nantes microcircuits showed that mass production is possible immediately, and that deliveries could begin in September. They also showed that the technology transfer from Intel to Matra-Harris proceeded very well.

This first stage proves to be very encouraging for MHS, which had predicted that the CMOS 8086 version would be introduced at the beginning of next year. The schedule is obviously being maintained, and everything leads to believe that it will be respected since the company has not stumbled until now. In a future issue after the vacation season, we will again discuss the prospects of Matra-Harris Semiconducteurs.

11,023
CSO: 3102/439

BRIEFS

SOLAR RESEARCH--Paralleling the work being done on photoelectric conversion, which does have the serious handicap of problems with storing the energy produced, research on solar photochemistry is progressing. The work being done at the organic and physical chemistry laboratory in Strasbourg offers the hope of being able to produce and store a fuel obtained from solar energy in a single operation. The research is concentrating on the irradiation of carbon dioxide and water under an ultraviolet light, which produces a synthetic $H_2 + CO$ gas with a high caloric power, composed of carbon monoxide and hydrogen, H_2. In addition, this gas is a source of carbon molecules which the chemical industry can use to replace the molecules obtained in petroleum derivatives. At present, the efficiency of the operation must be improved, and the reactions involved in this conversion must be fully analyzed. While it is not yet possible to predict the industrial spinoffs of this research, it is as important as the work being done on water photolysis, which separates hydrogen and oxygen by the action of sunlight. This research may be the start of an energy "chain reaction," which, starting from the sun's light, may lead to a fuel cell whose energy will be available at any time. [Text] [Paris ELECTRONIQUE INDUSTRIELLE in French 15 Jun 82 p 18] 7679

DUTCH COAL CONVERSION--The Dutch company Nederlandse Gasunie has postponed until year-end its decision on the construction of a coal gasification plant at Emshaven, which would cost $720 million. In justification of this delay, Gasunie cites the drop in oil prices and the substantial increase in investment outlays required. The initial project called for a unit with a production capacity of 1 Gm^3/year using the Lurgi process, on which construction had been scheduled to begin in 1983 with startup planned for the beginning of 1986. Gasunie also points to the problem that the proposed participation by the Dutch government did not measure up to its expectations (25 percent in tax abatements authorized instead of 40 percent). Apparently the final decision depends greatly on what takes place with the petroleum market in the coming months. The project could be canceled or postponed until the end of the 1980's. [Text] [Paris SEMAINE DE L'ENERGIE in French 22 Jun 82 p 10] 9828

CSO: 3102/368

VOLVO PLANT PRODUCES, SELLS INDUSTRIAL ROBOTS

Stockholm SVENSKA DAGBLADET in Swedish 17 Aug 82 p 20

[Article by Nils-Erik Lindell]

[Text] Olofstrom--Volvo's Olofstrom plant now is providing its competitors throughout the world with equipment that will permit them to produce automobiles faster and cheaper.

The tool shop in Olofstrom expects to export goods this year worth over 200 million kronor of a total gross of 290 million.

Volvo has had its greatest success with the so-called "doppin" robot, a feed attachment that makes body presses completely automatic. Over 700 of these robots have been sold--the first were sold to Saab--while over 100 are in operation in Volvo's own plants.

Volvo also has begun to sell assemble equipment for passenger car bodies. Recently an order worth 400 million kronor was received from a European automobile industry. So far, this is Olofstrom's largest order.

Volvo also is selling a newly developed spot welding gun. It is 60 percent lighter than conventional welding guns. This means that it can be operated not only manually, but also be a robot. Previously, this has been impossible. Ford, GM, and Citroen are testing the device, as is the Olofstrom plant, of course.

Furious Pace

Developments have proceeded at a furious pace. In 1978 orders for mechanized equipment totalled 11 million. In 1979 and 1980 the figure was about 30 million kronor. The 1981 prediction was 38 million kronor, but doppin robots actually were sold for 160 million.

It appears that the product developers and salesmen in Olofstrom are much more successful than the prognosticators.

But executive vice-president Anders Hansson takes the blame.

"I believed that our predictions should be cautious. Kjell Claesson, our purchasing and sales manager, was much closer to the truth."

When Kjell Claesson now says that sales this year will be at least as high as last year, however, Anders Hansson agrees--and the figures for the first 7 months are favorable. During that period, doppin robots were sold for over 80 million and contracts valued at 10 million kronor are practically complete. In addition to this, assembly equipment worth 60 million kronor will be sold this year.

"Still, we have only scratched the surface of the market," Kjell Claesson said.

Crisis In United States

Now Volvo is coldly counting on the crisis among American auto manufacturers. While Volvo, Saab, and BMW are selling more cars in the United States than ever before, domestic manufacturers have had to cut back considerably.

With full capacity, an American manufacturer could run a press line to produce the same part all day long. At present, the production program must be changed during the day and this requires mechanized handling. In the long run, 300 press lines in the United States must be rebuilt. This means investments of 3 billion Swedish kronor per year for 3 years.

"We are hoping realistically for 1 billion," said Anders Hansson, "and since we are a leader in this field we should be able to capture a sizable share of this market."

Expectations concerning the United States are so high that Volvo's salesmen have not yet dared approach the Japanese auto industry. There the market is even larger.

"There our robots could be used not only in the auto industry, although it accounts for 99 percent of our sales there," Kjell Claesson said. "They can be used equally as well in the household appliance industry, for example. Along with press manufacturers in Tranemo, we will be represented this fall at the large household appliance fair in Chicago, as a first step into this market."

Volvo faces strong competition in Europe, the United States, and Japan in the areas of mechanized equipment for presses and assembly equipment for automobile bodies.

Own Needs

"The interesting thing is that robots are made mostly by machine manufacturers and assembly equipment by welding companies," vice-president of sales Bertil Edlind said. "Our advantage is that we produce equipment primarily to meet our own needs and we can test it in our own shops. Our customers need not

break in new technology. The automobile manufacturers know this and this is one of the main reasons Ford and GM are major customers."

It was the need for a safe working environment that made Volvo the leader in this market. During the late sixties, personnel turnover was high at the Olofstrom plant--up to 80 percent in some sections. A survey showed that working on the press lines was especially unpopular. Feeding was done manually and there were many accidents.

Olofstrom studied plants throughout the world, but none had solved these problems, so the company's own designers were presented with the task. In 1971, 1 year after Volvo purchased Olofstrom from Alfa Laval, a prototype had been constructed and it was so highly acclaimed that its inventor, Arne Ronnback, received the Gustaf Dahlen Medal.

The Volvo Olofstrom plant has a total of 4,000 employees. The workshops that produce tools and materials handling equipment have only 350 employees, 80 of whom are designers.

Small Group

"By international standards, this is an extremely small group," Kjell Claesson said. "This is because much of what we do is a spinoff of our main task--pressing automobile bodies for Volvo."

This work could not be done without extensive training. The company's own school trains personnel of all categories--from blue-collar workers in the shop to designers and technicians.

This school also has become profitable for Volvo.

"After personnel turnover had been reduced, our capacity was too high," said Ake Westin, who is in charge of the training. "Now we train personnel from small companies in southern Sweden, as well as personnel from foreign automobile industries that purchase equipment from Olofstrom. This year we expect to sell training abroad for 1 million kronor."

9336
CSO: 3102/436

BRIEFS

CARBON FIBER PLANT--The British company, RK Textiles, one of the four principal suppliers of carbon fibers to the British market, intends to start up the largest production unit in Europe for this fiber before the end of the year. This plant, which will cost approximately 2 million pounds sterling, will have an initial capacity of 100 tons per year which can be doubled when market possibilities allow it. It is located near Inverness in Scotland and will constitute a real challenge to the Americans and the Japanese who, until now, have dominated the world market and the applications of this highly refined product. RK Carbon Fibres, a subsidiary of RK Textiles, which is building the unit, thinks that the latter will make a significant contribution to the possibilities of this fiber which is 50 times stronger than steel. Until now, it has been used principally in the aeronautical and automobile industries, but its qualities open the most diverse outlets for it, particularly in high-technology industries where qualities are more important than price. The carbon fibers are obtained by high-temperature treatment of a plastic, polyacrylonitrile. The Inverness plant will produce continuous filaments by a process perfected by the company thanks to a new design for oxide kilns, carbonization kilns and a special surface treatment. The company will produce two types of fiber at first. [Text] [Paris LES ECHOS in French 16 Aug 82 p 7] 9969

CSO: 3102/425

SCIENCE POLICY

'SUPER MINISTRY' OF RESEARCH, INDUSTRY CREATED

Paris AFP SCIENCES in French 1 Jul 82 p 1

[Text] The creation of a "super ministry" of research and industry was announced on 29 June by the Elysee Palace. According to observers, this decision demonstrates President Mitterrand's intention to spur on French industry through investment, despite the present climate of austerity.

This new ministry will be headed by Jean-Pierre Chevenement, 43 years old, who until now has been minister of research and technology. The decision to create this new super ministry, modeled on the Japanese MITI [Ministry of International Trade and Industry], does not come as a real surprise: the idea had been around for several months, and had cropped up at each rumor of a cabinet reshuffle. Mr Chevenement will, with this move, have his duties expand to cover the field occupied until now by Pierre Dreyfus, who is 73 years old.

After the major industrial restructuring which has been going on for the past year in traditional industries, such as steel, chemicals, textiles, etc., Mr Chevenement will now be able to turn his attention to the industries of the future, where he will be able to put in practice some of his favorite ideas: to emphasize research in order to emerge from the crisis, and above all, to define the left's new industrial policy, which has been awaited for a year.

For the upturn in consumption which began at the start of President Mitterrand's 7-year term has hardly helped industry at all; industry continues to limp along. It is known that Mr Mitterrand has decided to rely on the public sector, which in the past 6 months has seen the addition of five new groups, to spur on the economy. Investments in 1983 should amount to 25 billion francs.

Mr Dreyfus, who was in charge at 101, Rue de Grenelle for 12 months, and who is widely respected in industry, will still keep an eye on French industry. He will return to his post as an adviser to Mr Mitterrand, a post he held in the first Mauroy government.

7679
CSO: 3102/440

DRAFT OF FRENCH CIVILIAN RESEARCH BUDGET DISCUSSED

Paris LE MONDE in French 31 Jul 82 p 13

[Article by Maurice Arvonny, "Conforming to the Orientation and Programmation Law, the Budget Draft for Civilian Research Shows a Strong Increase"]

[Text] "The means are there, but not the positions." That would be the first and quick analysis that could be made of the civilian research budget as it appears in the figures indicated to research organizations.

The orientation and planning promulgated in mid-July for France's research and technological development announces two key figures: 17.8 percent for the average annual rate of increased funding--in volume, which means accounting for inflation--and 4.5 percent average annual increase in positions. Applied to the budget adopted for 1982, and accounting for the inflation rate of 8 percent on which the budget draft for 1983 is based, that leads to 2,575 positions created and 32.3 billion francs for all of the ordinary expenditures and program authorizations. This last figure is basically the sum that will figure in the 1983 budget, but the total number of positions currently planned only slightly exceeds thirteen hundred, or half of what could be expected.

But this total is not necessarily final. Without changing the total budget, it is still possible, by transferring approximatley 250 million francs from equipment expenditures to ordinary expenditures, to create the missing positions by designating them basically for the integration of personnel working on temporary jobs and by recouping them through the funds that remunerate these jobs.

The ordinary expenditures (formerly operational funding) were 12.7 billion francs in 1982. Since they cover essentially salaries, their increase is practically imposed. They will be nearly 15 billion francs next year.

The program authorizations that will make it possible to equip laboratories were supposed to exceed 17.4 billion francs. But this figure includes 0.5 billion for CII [International Data Processing Company]-Honeywell-Bull in the framework of a mobilization program for the "electronics industry" and 1 billion for the La Vilette museum of science and technology, in the framework of a mobilization program for distributing scientific knowledge. These

funds did not figure in the preceding research budget. If they are discounted, there are still 15.9 billion, compared to 12.7 billion in 1982, or an increase of 25 percent in current francs. Although it is less than what could have been hoped for, this increase is still much higher than what researchers have known in th past, except last year.

The government will to promote strongly several mobilization programs is going to be reflected by a great cotrast between the fundings for organizations. Some will be favored, but not necessarily in all areas.

Exceptional Effort in Data Processing

Thus, in the area of positions, the National Institute of Health and Medical Research (INSERM) with 230 positions created, should see its employment increase by almost 6 percent, while the 540 positions granted to the National Center for Scientific Research (CNRS) and the 210 that will go the National Institute for Agricultural Research (INRA) correspond to rates of increase of 2.3 and 2.8 percent respectively.

For program authorizations, the National Center for Space Studies (CNES) has an increase of 30 percent and the INRA of only 15 percent, while as currently allocated the Atomic Energy Commission (AEC) shows a decrease of 8 percent. But this percentage is not meaningful, since the 1982 a6d 1983 figures do not cover the same types of expenditures. The diversification of AEC activities could allow it to find non-budgeted financing for some of them.

The greatest increase if for the project to computerize the former Ministry of Industry. The program authorizations are to go from 640 to 1,360 million francs. With the funding for CII-Honeywell-Bull and the 370 million francs that are going to the Data Processing Agency and the National Institute for Data Processing and Automation Research, that is a lot for data processing.

AnotheOr figure is written in the law, or at least in the report appended to it which indicated that "the funding devoted to fundamental and cognitive research, whose recovery must be ensured, should have an overall and regular increase from now until 1985 at an average annual rate of 13 percent by volume." It is only when a more detailed allocation of funding has been done that the portion going to fundamental research can be evaluated, but it already appears that the CNRS, which does fundamental research almost exclusively, will only receive a smaller increase. Its program authorizations are increasing by 23.5 percent, or 14.3 percent by volume, but three quarters of this organization's budget is in ordinary expenditures, whose increase is definitely not as rapid.

The fact remains that, while certain research organizations can envy their neighbors, whiel certain directors will have to procede to difficult arbitration, the civilian research budget will have a great priority, since the entire national budget was only to increase by 4.1 percent by volume (LE MONDE 30 July).

9969
CSO: 3102/407

DAIMLER-BENZ, VOLKSWAGEN R&D EXHIBITED AT HANNOVER

Duesseldorf VDI NACHRICHTEN in German 14 May 82 p 10

[Article by Wolfgang Pester]

[Text] Automobile Research--A Magnet: Passenger Car With Hydrogen/Fuel Operation--Mechanical Charger in the "Auto 2000"

The Daimler-Benz and VW exhibits exerted a magnetic attraction. They exhibited things like electrocars having a nickel-iron traction battery and also exhibited engine developments for hydrogen operation which have been extensively researched. That there are still reserve potentialities in the Otto engine [internal combustion engine] is shown by the 1.06-liter four-cylinder battery for the little "Auto 2000"; its charging is taken over by a mechanically driven charger.

Hannover Fair. Innovation Market Exhibit Hall 7. An address firmly noted by visitors as it appears. For this market has a power of attraction which makes it one of the most visited displays. In this mirror of innovation there are two automobile manufacturers who cannot ever be omitted; they have written automobile history in research and development and in fact have written technological history: Daimler-Benz and VW.

The broad spectrum of engineering activities often even overwhelmed the visitor. Thus in the case of Daimler-Benz the abundance of research and development aimed at preserving individual transportation induced an interested expert to raise the question: "Why are so many [varied] efforts being made to achieve independence from petroleum fuel? Wouldn't it be better to choose from the available synthetic Otto engine or diesel engine fuels, alcohols, liquid petroleum gas (LPG), synthetic natural gas (SNG), hydrogen and electricity one alternative to be followed up consistently?" "What we are doing reflects the fact that we do not know how the energy situation will develop!" This reply from an expert speaker--Prof Dr Eng Hubertus Christ, chief of vehicular research in the Stuttgart firm--makes clear the range of decisions required in this domain. Because it is necessary to meet market demands on a worldwide scale over the long term it is necessary today to carry out research with regard to all possibilities.

Seen from this point of view many different developments receive an emphasis proportionate to their possible importance. This is true, for example, regarding an electric car based upon the T-model Mercedes, with which experimental data is being collected in street traffic which may be considered realistic up through 1983. The research vehicle attains with its short-term 32-kw electromotor (25-kw steady power) a maximum velocity of 80 km/hr and travels a distance of 100 km. If the driver should no longer be capable of feeding the dc electronically guided auxiliary engine with battery current because perhaps he underestimated the length of his trip, a small two-cylinder Otto engine assures him of getting to the nearest domestic wall plug (220 volts/16 amps) which may be over 50 km away.

The nickel-iron traction battery now being displayed for the first time is a joint development by Daimler-Benz and the German Automobile Society (Daug) and has a mass of 600 kg. Although the "energy package" fills up the storage space of the T-model almost up to the side window frame and puts the car into a "weight class" above 2 tons nevertheless the riding and operating comforts should match "Mercedes quality."

The same comfort and somewhat more luggage space and certainly also a little less weight have been provided by a T-model which in a fleet of 15 cars as of the beginning of 1983 will be subjected to typical everyday operation testing while using hydrogen drive. The hydrogen car is based upon essentially new developments which are being investigated in Berlin and Stuttgart in test driving; the cars include 10 with pure hydrogen drive and 5 using hydrogen mixed with another propellant.

The hydrogen drive is based upon "low-temperature metal hydride storage" which is constructed in the form of tubular heat exchangers. They are fed via water with engine heat taken from the exhaust. This yields the pressure required for operation of the hydrogen engine; the pressure can be kept constant by regulators.

The storage system employed makes it possible to tank up the hydrogen-driven car in less than 10 minutes. With the technology known hitherto this process could take as much as 2 hours. Cold starting is troublefree down to -20° C.

For operation exclusively with hydrogen the engineers modified a 2.3-liter four-cylinder injection engine which deviates from the mass production drive particularly in the mixing process and in the injection of water into the intake pipe.

In the case of the mixed drive power plant the people in Stuttgart turned to a 2.8-liter six-cylinder injection engine which was developed in cooperation with the University of Kaiserslautern by Institute Prof Dr Eng May. The engine is in this case simultaneously supplied via an electronic regulator with hydrogen and Otto engine fuel; when the load increases the Otto engine fuel percentage in mixed operation increases from 0 percent (no load) to 100 percent (full load). The partial replacement of the fuel by hydrogen assures better exhaust values in terms of NO_x and CO as well as securing a reduction

in fuel consumption amounting to as much as 20 percent (referred to the heat value of the fuel employed).

With its "Auto 2000" research car Daimler-Benz rounded off its collection of research data in this domain. That an equally high level of importance is attached to the "Auto 2000" in the research and development projects of VW is proven clearly by the Wolfsburg Firm at this innovation exposition: the "bug metamorphosis" for tomorrow occupied the foreground.

In Volkswagen's exposition of innovations a premiere appearance was made by the Otto engine drive design of the "Auto 2000" which gets its improved engine performance data by means of a mechanically driven charger. Already announced at the IAA 1981, the engineers worked at high speed and the last screws were tightened by the assemblers on the eve of the exhibit opening.

The main criteria of the drive design were that the vehicle should simultaneously attain high riding performance and low fuel consumption and that at the same time the relevant specifications regarding noise and pollutants should continue to be met. The engine nominal power was set at 55 kw. At this power the vehicle weighing 780 kg and presenting a wind-resistant surface of only 0.465 m^2 (c_w x F) should obtain a peak velocity of 180 km/hr and an acceleration time of 12 seconds from 0 to 100 km/hr.

The starting point was a four-cylinder series engine with 1.06-liter displacement. The charging power source is a mechanically driven rotary piston blower of the Roots type with a continuously variable gear ratio drive and a switch coupling which is controllable as a function of the load.

The mechanical drive of the charger by the engine drive shaft and the possibility of permitting, via the variable gear ratio in the lower rpm range, the charger to rotate more rapidly all make possible a high turning moment even at small engine rpm's and also in nonstationary operation. Via the electromagnetic coupling the charger is first switched on above the power range of the basic intake engine so that in partial-load operation there is no additional consumption of fuel for driving the charger. The adaptive knock-limit regulation developed by VW research secures the relatively high compression ratio of 9.2:1. The core of the arrangement is a control computer which in conjunction with the stored ignition angle characteristic data and the information provided by the "knock sensors" in the engine block guarantees an individualized operation along the knock limit. A reduction of the no-load rpm to 700 rpm supported the efforts to minimize the fuel consumption and emission of pollutants. Each cylinder obtained a separate injection nozzle. The regulation is taken over by an electronic guidance device which for each operating point, depending upon the engine rpm and the airflow, liberates the optimum quantity of fuel for "injection." The good mixing of air and fuel is guaranteed by air-mantled injection nozzles. Here also the optimization of the characteristic parameters is accomplished in terms of riding behavior, fuel consumption and pollutant emission.

Driven with a 3-E switch-drive the "Auto 2000" when operated at 100 km in "condition 3" [Drittelmix] (city driving, constant 90 km/hr and 120 km/hr)

consumes only 5.7 liters of fuel. Since the originally planned development of a four-stage automatic drive with converter had been red-pencilled it was decided in the interest of higher riding comfort to use a conventional three-stage automatic gear shift with overdrive; thus the listed favorable values of the 3 x E switch-drive are not fully attained.

The exhaust gas emission values were measured as 27 g in the CO test and 19 g in the HC/NO_x test. Thus this research car achieves the legal limit values which are to be prescribed in the future in Europe; however, in mass production use, especially in the case of the HC/NO_x emission, it would be necessary to maintain a wider safety distance from the limit values and it would be possible to accomplish this only by increasing the fuel consumption. The engineers emphasize this latter fact.

To reduce external noise the engine space was fully encapsulated. The riding noise when measured according to the ISO specification amounts to 73 db (A) and thus is consistent with legal specifications.

Although the other innovations being offered made the interested visitor curious (such as driving without a driver, synthetic speech as a new information medium in an automobile, energy scenarios and energy strategies or particle filters for diesel exhaust and also the use of vehicle gas turbines as in the case of Daimler-Benz) nevertheless the conversation always came back to charged engines. Three-cylinder diesel engines with exhaust turbochargers or with pressure-wave chargers in the VW exhibit showed what it is possible to achieve with them. Those questions remained unanswered which related to new developments of mechanical chargers usable also for Otto engines. Their possibilities are thought to be greater than those of the previously mentioned chargers and also greater than those of the Roots blower. However, one thing may be assumed with certainty: At one of the next Hannover fairs such a development will certainly be found in the innovation market.

8008
CSO: 3102/336

ENGINEER ASSESSES FUTURE OF ALTERNATIVE AUTOMOBILE ENGINES

Stockholm MOTOR in Swedish 18 Jun 82 pp 28-29

[Article by Iva Maasing]

[Text] Recently various types of future or alternative engines have been discussed in the mass media. The Kronogard gas turbine was shown on television, the Stirling engine was mentioned on the radio, and the piston engine developed by Lars Hedelin was described in a newspaper article.

But what are the prospects for the future of these engines? Can they become alternatives to existing automobile engines?

MOTOR's technical expert, civil engineer Iva Maasing, had the following thoughts on such engines.

The Kronogard Gas Turbine

In theory it is undeniably elegant, with three separate turbine wheels whose axels are connected by gear wheels, so that enough driving power is generated that no transmission is needed. The use of ceramic material in the turbine wheels and in the surrounding walls that come into contact with the hot combustion gases makes it possible to operate at high gas temperatures which, in turn, improves efficiency.

In other words, more useful energy is obtained from a given quantity of fuel.

The three small turbine wheels also reach a high speed quickly when the driver depresses the gas pedal. Thus, this engine has a faster response than previously designed experimental turbines.

But it is difficult to have several turbine wheels and guide blades operating reliably in the hot environment.

The American companies that are experimenting with gas-turbine automobiles, including Ford in conjunction with the world's largest gas turbine producer, Garrett, have decided to reduce the number of components in the hot portion of the engine.

The Ford-Garret turbine, called AGT 101 where AGT stands for Advanced Gas Turbine, has only one turbine with its axel in the hot section. To improve efficiency and reduce the response time, it has movable guide blades, but these are in the cold portion of the engine near the compressor.

Thus, the question is whether or not Kronogard's complicated turbine, with many components in the hot section, can perform reliably in the long run.

Finally, we must ask whether or not the gas turbine can compete at all with the more developed gasoline and diesel engines now produced by engine manufacturers throughout the world. These engines are fuel-efficient and have a quick response. They can be mass produced with existing machinery and we know that they are reliable.

The Stirling Engine

In the same town in which Kronogard has its experimental workshop, Malmo, another company is working on an engine of the future, namely United Stirling.

The Stirling engine also appears attractive from a theoretical standpoint. Like the gas turbine, it can run on various fuels, it can be made extremely quiet, and it can be made to run clean more readily than most other combustion engines.

Just like the gas turbine, however, it has problems that prevent it from competing with conventional engines.

First of all, the Stirling engine is more complicated in design and requires expensive, extremely heat-resistant materials to achieve high efficiency.

This means that production costs would be much higher than for conventional engines.

In addition, its speed regulating system is considerably more complicated than in conventional engines--which also is true of the gas turbine.

The future of the Stirling engine is to be found only in highly specialized fields. For example, it can be used as an engine driven by solar energy. In this case, the "heat pan" of the Stirling engine simply is placed at the focal point of a large parabolic mirror that concentrates the solar rays on the heating tube. Thus, no fuel is needed to start the engine--but much sunshine and a clear sky are required.

Thus, it could be used to drive a generator or to operate water pumps in the desert.

The Hedelin Engine

This engine also looks good in theory. By varying the shape of the camshaft, the valves of the engine can be opened and closed at various times and a

movable control piston in the cylinder head varies the cylinder volume and the compression.

These two features make it possible for the engine to adjust well to different acceleration rates and speeds. In theory, it could be adjusted so that it always operated at the low end of the fuel consumption curve.

But it is a long way from the elegant theory to daily practice. This has been discovered not only by individual inventors such as Lars Hedelin, but also large manufacturers of engines who have been unable to make the new technology operate reliably in everyday driving--although hundreds of millions of kronor have been invested in this technology.

I could simply mention Ford's unsuccessful experiment with Proco combustion, called laminar-charge combustion in scientific terminology.

At present, BMW seems to be having serious difficulties with its new direct injection diesel passenger car, designed by an Austrian professor of engine design.

This engine has many new design features, such as a cylinder head and block in one piece with no head gasket in between, a sound insulating "outer skin" around the entire engine, and a camshaft-controlled injection pump and fuel injector in one unit for each cylinder. It appears that this latter feature is causing the most serious problems.

Several years ago another Swedish inventor presented his so-called Alvar engine with a divided crankshaft that could vary the cylinder volume and the compression according to operating conditions. This project, which was simpler than the Hedelin engine, also failed to make the transition from basic experimentation to everyday driving conditions.

Electric Car A Flop

Electric cars also are having a difficult time making a breakthrough, even though they have no problems with "hot zones" or untested technology.

There simply are no batteries capable of storing sufficient energy. From time to time the mass media report the discovery of a new, more energy-dense battery, but so far none of these experimental batteries have been installed in an electric car. Some of these batteries hardly could be used in automobiles, since they operate at temperatures of several hundred degrees when they deliver their energy. The idea of driving around in traffic sitting on heavy batteries operating at 300 to 400° is not especially pleasant!

The General Accounting Office, which is the equivalent in the United States of our Accounting and Auditing Office, recently reported that it considered the large-scale state program to develop electric cars to be a flop!

Only when a better, i.e. more energy-dense, battery has been developed will this epithet be removed! It is hopeless to drive 50 to 60 km per charge,

which has been done in everyday traffic, and then have to wait 8 to 10 hours while the batteries are being recharged. Swedish authorities, who have tested electric cars on a small scale, also have noted that the range is shorter than originally promised. Just ask drivers of cars belonging to the Telecommunications Service what they think of electric cars and their range!

9336
CSO: 3102/417

AIRBUS PRODUCTION RATE INCREASED BY USE OF NC MACHINES

Paris INDUSTRIES & TECHNIQUES in French 20 May 82 pp 48-49

[Article: "At Aerospatiale-Nantes: A Line of Four Milling Machines"]

[Text] In line on a 57-meter bed, the milling machines operate in masked time. Productivity gain: 39 percent.

The growth of the Airbus large transport aircraft program has led to a significant acceleration of manufacturing schedules. To help production keep pace with the increased workload, the need for investments in the area of numerical control milling machines quickly became apparent.

With the main goal being to limit these investments, a study was conducted to establish the parameters which would hinge on a particular action, with a view toward improving the productivity of the so-called new generation machines. With the previous equipment, the time spent in machining under numerical control represented only 36 percent of the total available time. The new specifications required that the work be done in masked time on machines with aspirated removal of cuttings and with either long tables or smaller tables arranged on a common bed of great length. The new specifications also called for lateral movement of the cutting heads and automatic tool height adjustment.

Parts 18 to 54 Meters Long

Aerospatiale [National Industrial Aerospace Company] decided on a milling line having four gantries traveling over a single bed. Each machining group was equipped with accurate servomechanisms connected to a programmable TSX 80 robot. The installation was built by Intertec.

Considerable time savings were achieved: while one piece was being machined, the operator could be setting up the next one on the work table or removing the preceding one. As a result, the time savings have risen to 28 percent of the operating time. These savings involved mainly the preparation of the work, mounting and dismounting of workpieces and tools, adjustment of tools, changing of sequences, and stoppages for repairs, the majority of which are performed while machining proceeds under robotic control. The working surface was made smaller by eliminating side tracks, and the length of the installation made it possible to machine parts with large dimensions.

The installation consists of four modular gantries, each with a heavy-duty Polytrace structure equipped with three cutting heads; the gantries move back and forth on a bed with a working length of 54 meters, motion being transmitted by unilateral drive mechanisms. Each of the gantries has a longitudinal traverse of 18 meters, and overlap over two stations is possible. The transverse axis, with an available traverse of 2.3 meters, permits the cutting heads to be set with interaxial spacings of up to 700 or 1,200 mm, depending on whether the machining is done with three or two cutting heads. Finally, the traverse along the vertical axis is 500 mm.

The longitudinal and transverse feeds in the machining mode are adjustable in a range from 0 to 2,500 mm/min, and a rapid traverse feed of 5,000 mm/min is available during other operations. Along the vertical axis the work feed is adjustable between 0 and 1,500 mm/min, and the rapid traverse speed is about 1,500 mm/min. The motor of each cutting head develops 22 kW of power at 6,000 rpm, and the speed range extends from 750 to 6,000 rpm.

These technical characteristics provide considerable machining capacity. It is possible to machine parts which measure up to 18 meters on one gantry, and up to 30 meters with two gantries. The total length of the parts could even be as large as 54 meters, using all four milling units. To take full advantage of these features, some carefully chosen special features on the stations supplement the general system, to enable work to be done in masked time. Thus the operations of consulting the instruction records displayed on the CRT screen, preparing for setting up the workpieces, and clamping them in place are done in a time period distributed half during the milling cycle and half while the relevant machine is stopped. The length of the tables and the overlap of the longitudinal traverses of the gantries permit the operator to perform the entire mounting and dismounting of the workpieces and tools while machining is proceeding under numerical control.

The same is true for installation and removal of the cutting tools, including selecting the proper tool, removing the tool protector, and checking the tool diameter. The tools are prepared and pre-positioned during productive time on a trueing system, to be ready for the next machining sequence. The cutting tools are changed from the side, by virtue of the fact that the transverse carriage is offset beyond the table and the fact that the cutting tool, opposite the operator station, can sweep across the entire width of the table. Furthermore, the tool height is adjusted automatically, which saves time in executing these operations. These phases of the operation take place in complete safety: the tools, arranged in an inclined rack, cannot be released until a locking mechanism is released.

These various features are an outgrowth of the ergonomic design of the operator station, set up so that the operator does not have to make inconvenient and tiring trips back and forth on the table.

The height adjustment is obtained on contact pins (proportional to an adjustment pin through the cutting tool) located at the operator station. This version was the subject of a prize awarded by the Fund for Improvement of Working Conditions. It should be pointed out that with the three cutting

heads the lateral movement of the cutting head and automatic height adjustment require only 2 minutes 15 seconds for the entire procedure, including the 34 seconds required for the adjustment.

The feeds are controlled by silent motors powered from rectifiers, drawing 25 kW per unit, serving to advance the cutting tools. The rectifier type of converter was chosen because of the energy savings it offered relative to the power consumption of a synchronous converter.

Each gantry operates under numerical control from an NUM-460 computer linked with a video console. This permits a detailed and differentiated examination of paths of operations in progress on the machine. With this equipment, the corrections for tool diameter and corrections of the part programs in the course of proving operations are possible, and so are application of specialized subprograms, entry and display of screen data, and input of maintenance programs.

After a number of months of industrial use in the Nantes factory, it has been confirmed that the progress obtained in the area of working conditions and the gains in productivity greatly exceed the requirements of the specifications.

9828
CSO: 3102/364

COMMENTS ON STATUS OF AIRBUS A 320 PROGRAM

Paris LE NOUVEL ECONOMISTE in French 2 Aug 82 p 42

[Article by Ph. G.: "Canada Votes for Airbus"]

[Text] De Havilland Canada, a world specialist in short-range takeoff planes, is joining the small world of large aircraft manufacturers by deciding to embark on the A 320 operation along with Airbus Industrie. This new program for a 150-seat short- and mid-range "small" twin jet is to complete the Airbus line which already includes the A 300 (260 seats) and the A 310 (200 seats). It should fly in 1987, provided that companies other than Air France say within the next few months that they will buy it.

A former subsidiary of the British manufacturer of the same name, taken over by Canadian public funds in 1975, De Havilland Canada is located in Ontario at Downsview, just outside Toronto. It is there that the regional transport Twin Otter planes (which serve the mountain airports in Savoy, for example) and the Dash 7, as well as the Buffalo military transport planes, were designed and mass produced. But a substantial portion of the activity of De Havilland (which employs 4,200 persons and has sales of close to 2.2 billion francs) consists of subcontracting work done primarily for the large American manufacturers.

Therefore, John Sandford, the president of De Havilland Canada, and his top managers want to substitute a real partnership for this subcontracting; "We intend to manufacture elements of mass-produced planes for which we will have full responsibility," he explains. By becoming a partner of Airbus Industrie for the 320 and, why not?, for other later programs (300-seat, super-Airbus or long-range four-jet plane), the Canadian firm is counting on playing a more "constructive" role and, by allying itself with the European aircraft manufacturers, it is engaging in "the third option" recommended by Pierre Elliott Trudeau to free itself a little of the economic domination exercised by its powerful neighbor.

According to the protocol of an agreement signed several days ago by Sandford and Bernard Lathiere, owner of Airbus Industrie (with the backing of the federal government, several weeks after conversations carried out on site by Charles Fiterman, the "first communist minister to tour North America"), this participation could reach up to 10 percent. It would involve a capital outlay

on the order of 1.2 billion francs by Canada as well as, in all probability, the construction of a plant in Quebec. For Airbus Industrie strategy, having a partner in Canada and, consequently, thumbing its nose a little more at Boeing, is one of the "nonnegligible new elements."

It remains to be seen how and when the Airbus 320 operation will be completed. At the moment, the division of industrial responsibilities has not yet been made. As for the development budget, the French would be disposed to guarantee about 30 percent, the British nearly as much (or 10 percent more than for the A 310), the Germans only from 18 to 20 percent, Spanish, Belgians and Dutch approximately 9 percent all together. As for the Italians, they had said they were ready to take 10 to 15 percent. That would already exceed 100 percent...!

In the meantime, Airbus Industrie is filling out its sales scorecard: nine A 310's sold to VASP, the domestic Brazilian company, by Jean-Yves Richard, sales manager for Latin America. To replace Boeing 727's and 737's....

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CSO: 3102/425 END

JPRS 81905

1 October 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 122

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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JPRS 81905

1 October 1982

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SCIENCE AND TECHNOLOGY

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BIOTECHNOLOGY

GENETIC ENGINEERS PRODUCE SURFACE PROTEIN OF RABIES VIRUS

Paris LES ECHOS in French 5 Aug 82 p 7

[Article: "Revolution in the Struggle Against Rabies: A French Vaccine by Genetic Engineering"]

If anyone is accusing French industry of being "underdeveloped" in the field of genetic engineering, the much-discussed biotechnology, the Transgene company provides a resounding denial. Indeed, its laboratories in Strasbourg have succeeded in producing rabies virus surface protein by genetic recombination.

In scientific terms, they have succeeded in getting a microorganism to express the glycoprotein of the virus responsible for this dread disease. This spectacular breakthrough by French researchers has its origins in the isolation of the gene for this glycoprotein by the Wistar Institute of Philadelphia.

Transgene, founded in 1980, is a French company specializing in genetic engineering. Its research programs, being carried out by some 40 specialists, are aimed at industrial applications in fields such as pharmaceuticals, fine chemicals, and the agro-food industry. As early as last April the company announced that its laboratory had succeeded in cloning the gene for gamma interferon, work done on behalf of Roussel-UCLAF.

The artificial synthesis of the surface protein of the rabies virus is a world first, which appears to have enormous practical implications. Moreover, to proceed to the development stage, Transgene has now concluded a research agreement with the Merieux Institute calling for production of rabies glycoprotein by genetic engineering and research on its immunological properties, to make possible the industrial development of an anti-rabies vaccine.

The Merieux Institute, a subsidiary of the Rhone-Poulenc group, holds a position among the leaders in industrial biology and particularly in the field of vaccines.

500,000 Immunized Each Year

Immunication against rabies is not a new procedure. It is estimated that 500,000 persons are immunized each year in the world, including some 30,000 in the United States and several thousand in France.

Genetic engineering, however, offers the possibility of appreciably lowering the cost of immunization. Up to now, the high cost of traditional vaccines has meant that even in developed countries the use of immunization as a preventative measure is relatively low.

With the technique of genetic engineering, it is possible to consider an entirely different strategy. Instead of cultivating the virus itself using very elaborate culture procedures and then inactivating the virus, genetic engineering makes it possible to avoid working with the virus and instead work only with the glycoprotein. This glycoprotein fraction on one hand has the property of being the carrier of antigenic sites and on the other hand is not capable of independent propagation.

Therefore, by producing and using the rabies glycoprotein, immune protection can be obtained without the slightest risk of contagion at any stage during manufacture or use.

Transgene is now entering a new stage: On one hand, with the help of Merieux, the company is trying to achieve industrial manufacture of the glycoprotein by microorganisms or in cell culture; on the other hand, it would like to determine more precisely what portion of the glycoprotein constitutes the antigenic site or sites.

Biotechnology: Investments

Elsewhere, biotechnology is now being heavily developed both in the English-speaking countries and in Japan. Accordingly, it has been learned that W. R. Grace & Co., a large American conglomerate with interests primarily in chemistry, plans an investment of $50 million over the next 5 years to intensify its research in the biotechnology field. It intends to make acquisitions in this field, but of course is not revealing what companies may be targeted for takeover. In another move, Grace has signed a contract with MIT (Massachusetts Institute of Technology) for scientific collaboration in the field of microbiology, involving a planned expenditure of $8.5 million.

In Great Britain, on the other hand, John Brown Engineers & Constructors and the Dalgety-Spillers, Galahers, and Whitbread firms have recently decided to invest 1 million pounds sterling to share in research carried out by a biotechnology research laboratory founded by the University of Leicester. The university has allocated 183,000 pounds to equip the laboratory, which will become a full-fledged biochemistry center.

The programs will include work on the genetic transformation of microorganisms for the agro-food industry and for the development of new products such as medications and enzymes.

Finally, in Japan, MITI (Ministry of International Trade and Industry) is presently carrying out a 7-year plan to develop biomass technologies and has launched a 10-year plan calling for spending 26 billion yen for the development of biotechnologies, while very substantial investments are also being made by the private sector.

9828
CSO: 3102/414

HOECHST STEPS UP PACE OF GENETIC, BIOTECHNOLOGY RESEARCH

Duesseldorf VDI NACHRICHTEN in German 4 Jun 82 p 24

[Article by Hartmut Welfert: "Hoechst Pushes Genetics and Biotechnology"]

> [Text] Hoechst AG, Frankfurt/Main-Hoechst, whose worldwide sales increased 15.1 percent to over DM 34.4 billion last year while it became the largest chemical company in the FRG, attributes its relatively favorable results in the face of worldwide economic stagnation to a considerable degree to the fact that, in the words of Board Chairman Prof Rolf Sammet, "Our broadly based research and development activity is bearing fruit." Of course, the "harvest" presupposes considerable investment in the "seeds": and thus Hoechst has invested DM 1.5 billion worldwide. That was even more than the targeted before-tax worldwide profit of just under DM 1.2 billion, which figure itself is lower by DM 352 million than in 1980.

In the long run, Hoechst is betting on genetics and biotechnology. Here one expects decisive impulses for the medicines of tomorrow and for agriculture and environmental protection. Since with the aid of genetic technology methods certain bacteria can be programmed to produce compounds not contained in their original genetic blueprint, in the future hormones, antibiotics and vaccines can probably be more economically produced in this manner. Intensification of this research is fostered by an agreement between Hoechst and Harvard University's Massachusetts General Hospital in Boston on joint efforts in genetic technology.

In biotechnology Hoechst is continuing its effort to produce natural substances such as protein, enzymes, nucleic acid and polysaccharide from microorganisms. Bioproteins, which could be produced from protein with the aid of enzymes, are of interest to the food-processing industry because of their emulsifying and foaming properties. An installation operation on the principle of the continuous fermentation process for bioalcohol developed by Hoechst will be built this year at Frankenzucker AG now that an initial demonstration facility has already been built by Uhde, the Hoechst subsidiary in Brazil.

Further centers of research interest at Hoechst lie, according to tradition, in the pharmaceuticals branch, which received DM 645 million; in plant protection; in the information technology unit operated by Kalle AG in Wiesbaden; in coal processing and in dyes and pigments.

It is hardly surprising that during the 1981 business year there were both bright and dark spots among the numerous branches of the Frankfurt chemical giant. While, for example, the fiber branch finally came again into the black after a long slump, earnings in dyes, pigments and paints have clearly got worse. The plastics business also fared very badly. Here there was a recurring drop in usage in Western Europe, amounting to about 10 percent and affecting mostly standard qualities. Technical plastics on the other hand were again in better demand. Also, medicines registered outstanding sales growth through real growth in quantity.

There were significant differences in domestic and export business. While domestic sales volume slipped by about 1 percent, export volume climbed by about 6 percent, resulting in an estimated sales gain of 4 percent for the company. From worldwide sales DM 9.5 (9.3) billion [all statistics given in parentheses are for 1980] was generated at home and DM 24.9 (20.7) billion abroad; and 13.3 (10) billion of the latter amount came from production facilities abroad.

Hoechst AG received DM 12.2 (11.2) billion from sales, logged a before-tax profit of DM 718 (905) million and an after-tax profit of DM 353 (364) million. From this the stockholders will again receive a divident of DM 7 for each DM 50 share. In addition they will vote on the creation of DM 300 million of authorized capital for the use of which, however, there are according to Sammet, "still no concrete plans."

The first quarter of 1982 has been rather disappointing. It is true that Hoechst AG sales have increased by 5.6 percent to DM 3.25 billion, but before-tax profits of DM 203 million remained 4.2 percent below those of the first quarter of 1981. Worldwide sales increased by 5.4 percent to DM 8.9 billion. The company, which employs almost 185,000 workers, looks toward the remainder of the year somewhat skeptically.

Worldwide Hoechst Sales by Business Area

Area	1980		1981		
	Million DM	Fraction Percent	Million DM	Fraction Percent	Change From Previous Year Percent
Pharmaceuticals	4,755	16	5,748	17	20.9
Paint and plastic resins	3,612	12	3,980	12	10.2
Plastics and waxes	2,885	10	3,202	9	11.0
Fibers and initial products	2,282	8	3,003	9	31.6
Inorganic chemicals	1,851	6	2,059	6	11.2
Agriculture	1,573	5	1,834	5	16.6

Dyes, pigments and initial products	1,426	5	1,626	5	14.0
Welding products and industrial gases	1,344	4	1,535	4	14.2
Organic chemicals	1,299	4	1,520	4	17.0
Foils	1,252	4	1,415	4	13.0
Surface active agents and associated products	1,106	4	1,256	4	13.6
Information technology	1,056	4	1,234	4	16.9
Facilities construction	731	2	803	2	9.8
Consumer products	561	2	717	2	27.8
Partner businesses	4,182	14	4,503	13	7.7

9160
CSO: 3102/399

BRIEFS

MICROELECTRONICS PROGRAM GOING WELL--Federal Research Minister Andreas von Buelow will beef up his ministry's program for the support of microelectronics. As the minister related recently in Bonn, DM 450 million will be made available for this program in the 1982-1984 period instead of the DM 300 million previously allocated. Von Buelow emphasized that microelectronics will be moved ahead decisively with these funds. The minister expressed his satisfaction with the quality of the projects submitted for support since January of this year. Industry's response was rapid, and the special program will presumably be booked up in July. Additional increases in funding are not to be expected in view of the tight budget. Von Buelow indicated that with the DM 450 million about 2,000 projects for applying microelectronics in new products could be aided; 1,800 requests have been made to date. [Leinfelden-Echterdingen DIE COMPUTER ZEITUNG in German 2 Jun 82 p 1] 9160

CSO: 3102/437

ENERGY

NORTH GERMAN INVENTOR DESIGNS SHIPBOARD WIND TURBINES

Hamburg DER SPIEGEL in German 23 Aug 82 pp 79-80

[Article: "A Good Chance"]

[Text] With an original design, a North German inventor intends to prove that wind energy is cheap and producable in abundance.

Guenter Wagner, proprietor of a four-man business in the List community of Sylt intends to challenge the giants of the energy industry. With a wind-driven rotor at sea, Wagner first wants to supply the Frisian Island of Sylt with electricity and later even the state of Hamburg.

"Instead of atomics and coal," asserted the trained aerodynamicist, "wind energy can soon supply large areas along the coast." The aerodynamicist hit on a novel scheme for utilizing this form of energy.

Wagner, who came by some money from patents, bought a 30-meter-long, 70-year-old cutter. In the after part of the ship, he installed a used transmission in a canted position. On the transmission Wagner placed a 25-meter-long, almost horizontal working blade and a short upward-flapped stabilization blade.

Below in the stern of the ship, the perfectionist reinforced the transmission bearings with heavy iron supports, flanged on an electric generator and designated the whole thing as a floating wind power plant. The system, which was put together with about DM .5 million of his own money, worked from the start: Since the beginning of 1982, Wagner's floating wind turbine has been producing 250 kW (.250 MW) of electric power.

With his research ship, Wagner wants to convince engineers, economists, politicians and public officials by demonstration that simple designs can pay off big. Wagner sees in mounting the windwheel at ground level a distinct advantage compared to mounting wind-driven rotors on tall towers.

By scaling up his simple model, the man from List hopes to be able to open up large energy sources which are still blowing around unused. In this connection Wagner calculates that a blade 4 times as large on an 80-meter-long ship can

generate instead of 250 kW an amount equal to 7,000 kW (7 MW) which is about a third of the average electric power demand of Sylt. "And that," animatedly asserts the inventor, "is more than the Growian wind tower produces with a subsidy of DM 80 million--only it is cheaper."

Cheaper--Wagner believes he can assemble his power plant for DM 10 million--because "there is presently no shortage of idle ships." Accordingly, Wagner has in the meantime talked with the Hamburg ship owner Horst Bartels about consigning him his 1,285 grt motor ship "Neuwulmstorf." The ship is almost 90 meters long and will carry Wagner's next wind rotor with which, it is claimed, 7 MW of electric power can be generated.

The inventor and the ship owner will have the "Neuwulmstorf" refitted for the wind power plant at a shipyard, and starting next year it will transmit its electricity to Sylt via a 4-km-long underwater cable which will cost DM 600,000.

The targeted customer is the Schleswig-Holstein Electric Company AG (Schleswag) with which Wagner has already agreed by letter to discuss a long-term contract for the "acceptance of electricity from shipboard wind power plants."

At the Bonn Research Ministry, which purposely proceeds with caution in supporting small but often misdirected inventors, Wagner nonetheless received affirmation that certain measurements will be financed with public funds in the future. Also, Wagner would like money from Bonn in order to be able to report on his experimental power plant at a wind energy symposium in Stockholm.

Hamburg's Mayor Klaus von Dohnanyi, who wanted to prepare himself for talks with his new friends from the Green Alternative List, visited Wagner's experimental cutter during his recent Sylt stop.

Impressed, but somewhat at arm's length, Dohnanyi expressed interest in Wagner's wind machine because, in the mayor's opinion, Hamburg should become an energy center. "From this perspective," according to Dohnanyi on board, "this system is naturally a strong contender." According to Wagner's rough calculations, his wind power plant can be produced for DM 1,500 per kW. Nuclear power plants cost DM 4,000 per kW not counting the fuel.

Therefore, according to Wagner, his power plant supplies electricity from the environment but does not stress the environment with exhaust gases or obtrusive structures. Wagner's ships will be stationed about 4 km off the coast line.

Heinz Otto, an employee of the Blohm + Voss shipyard in Hamburg and in private life a member of the Working Group for Alternative Products has already petitioned the members of the Hanseatic Council regarding installing Wagner rotors "on the state-owned Neuwerk property." By such use, the "bad investment in Neuwerk" could be justified after the fact. Hamburg bought the island near the mouth of the Elbe 12 years ago from Lower Saxony in the false hope of being able to build a deep-water harbor there.

If things were to go according to Wagner's plan, 7 large ships each with 400-meter-long working rotors would be anchored off Neuwerk, and together would generate 700 MW. That would be almost as much as the costly Brunsbuette

nuclear power plant delivers. To determine whether or not such optimistic calculations are permissible and to be on the conservative side, the inventor would like to discuss them with scientists and have them checked by computer. For at the very least, installing such gigantic blades on a ship is a difficult task and costs lots of money.

Wagner's contacts at Schleswag still exhibit some skepticism, feeling that they have been exposed only to behavior relating to smooth operation at wind states between 4 and 9. "We would have to," they wrote Wagner concerning alternative-energy distribution firms, "demonstrate to our board of supervisors how you would assure your long-term delivery capability."

For Wagner himself there is no doubt. The inventor with a prophetic look at his cutter: "The design principle is simple and the physics is correct."

9160
CSO: 3102/437

BRITISH PLAN LARGE-SCALE USE OF FUEL CELLS BY END OF 80'S

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
12 Aug 82 p 7

[Article by TAR: "Can Fuel Cells Be Utilized Commercially in the Near Future?--The British Hope for Power Plants for Entire Communities; Prototype Plants in the United States and in Japan"]

[Text] Frankfurt, 11 August--Some time in late eighties the energy requirements of whole communities in Great Britain will be met by means of fuel cells--clean and without noise. This is the quintessence of a report on the state of the art of fuel cells, which the Energy Technology Support Unit (ETSU) of the British Government is working on. The report, which the British NEW SCIENTIST commented on briefly on 22 July, predicts that by the turn of the century, fuel cells of plants having a maximum output of 500 kilowatts could have the capacity to generate a total of 250 megawatts.

Fuel cells are by no means the newest achievement of technology. Sir William Grove was the first to describe the principle more than 140 years ago. The development work which began after World War II, was considerably intensified by the oil crisis. As a result, the capital requirements were reduced, and the limits of technology were pushed farther and farther.

As a source of power or heat, the fuel cells afford astounding opportunities. They work without generating noise or developing any fumes and can be operated with practically any fuel. Their efficiency can approach 80 percent, because the restrictions of mechanical aggregates do not apply. On principle, a fuel cell only requires very few moving parts. Its design is simple, maintenance is easy. An entire plant can be assembled from a number of cell components, and the plant, in turn, can be extended with increasing demand.

However, the problems should not be concealed. While the low-and medium-temperature cells operate between 0 and 150 or 150 and 250 degrees Celsius, the operating temperatures of the high-temperature cells working with cost-effective catalysts and direct reaction are 500 to 1,100 degrees Celcius. When reaching the upper temperature limit, the metals already glow in yellow heat. Therefore, their life and reliability are not quite satisfactory yet. In addition, the fuel cells require catalysts made of precious metals in order to operate without any problems. It is self-explanatory that these are rather

expensive. Only the high-temperature cells can do without precious-metal catalysts. In the United States, scientists and engineers have spent hundreds of millions of dollars to develop the technology. Most of the funds came from government agencies. However, large corporations, e.g., General Electric, Westinghouse, United Technologies and Engelhard Minerals have also advanced their projects at great expense. The U.S. researchers believe that their objective of approximately $500 per kilowatt is already quite close and that fuel cells will therefore be marketed around the mid-80's. The U.S. space shuttle "Columbia" is powered by fuel cells, for example.

Currently, prototype plants of 4.5 megawatts as a predecessor of fuel-cell power plants with an output of many hundred megawatts are under construction on Manhattan Island and near Tokyo. In Great Britain, however, neither the Central Electricity Generating Board nor the ETSU expect that large fuel-cell power plants will be used to ensure the power requirements of Great Britain in the forseeable future. The supply of electricity and/or heat to local supply systems, however, is well conceivable. The British John Matthey Co, which smelts precious metal, appears to have advanced the furthest with its preparations to take up production. As of next year, the company will commence the supply of small 500-W units. For the time being, the supply of the armed forces with a noiseless, emission-free power source for field use is contemplated. This could be a step in the direction of the more desirable production of combined heat and power sources of 50- to 250- kW output.

According to the ETSU's estimates, the British market will be at 100 million pounds sterling around the year 2000. Furthermore, this institution believes that 500,000 tons of coal worth 50 million pounds annually could be saved through a fuel-cell output of 2,500 megawatts, with the operation at a 75-percent capacity. Following a limited field test in the early 70's, more than 40 fuel-cell generators of a 40-kW output are operated in the United States to supply apartment blocks, warehouses and hospitals with power. Johnson Matthey is currently trying to get the British Ministry of Industry to provide 400,000 pounds for the installation of such a system in London.

According to the report, a hospital would be the ideal location for a combined heat/power supply system because its energy requirements are considerable, thus the fuel-cell plant could operate efficiently without generating operational noise or harmful substances in the exhaust gas. If the present technical and economical difficulties should be overcome, a potential of approximately 10 gigawatts of electrical and thermal energy can be expected from local fuel-cell installations in Great Britain.

9544
CSO: 3102/428

MBB COMPLETES ROTOR BLADES FOR GIANT SWEDISH WIND TURBINE

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 18 Aug 82 p 5

[Article: "Bremen Rotor Blades for 'Aeolus'"]

[Text] Vereinigte Flugtechnische Werke GmbH, Bremen. One of the most remarkable structural components ever developed by the aeronautical industry has been fabricated at the Lemwerder factory of MBB/VFW. These components are two rotor blades for one of Europe's largest wind-energy installations which is presently being erected on Sweden's Gotland Island in the Baltic. Each of the blades for "Aeolus" is 35 meters long and has a maximum chord of 4 meters. The two blades plus the hub produce a rotor diameter of 75 meters. This gigantic drive element will be mounted on an 80-meter-tall tower on Gotland, according to company information.

The outstanding feature of this structure, according to VFW, is the fact that the metal shell is both the load-carrying structure and the aerodynamic contour. With this construction, subsequent maintenance work will be significantly eased since these parts are accessible for crack checks without disassembly. For assuring the structural integrity of the rotor blades, a fiber-optic crack sensor monitoring system developed and tested by MBB/VFW was built into the blade surfaces.

The development engineers and designers at MBB/VFW succeeded in designing and building the rotor blades for a useful life of more than 3 decades. During this period, they will execute more than 300 million cycles at temperatures between minus 40 and plus 55 degrees C. Also, they must be able to withstand what is known as the "century hurricane" which packs winds up to 220 km/h. Of the 8,760 hours in a year, the wind-energy installation will supply electricity for 6,000 hours and will deliver full power of 2,000 kW for 1,600 of these hours. Annual output will be 6.5 million kWh.

9160
CSO: 3102/438

NEW FUEL-OIL, COAL MIXTURE VERY STABLE

Paris L'INDUSTRIE DU PETROL GAZ-CHIMIE in French Jul-Aug 82 p 70

[Article: "Fuel-Oil Coal Dispersion: A BP Innovation"]

[Text] BP [British Petroleum] has perfected a new liquid fuel that it could market in 1985. A public test at the BP Dunkerque refinery allowed the French subsidiary of the group to demonstrate both the fuel and its combustion in a boiler. The proof has been given of the product's reliability. But what is it really all about?

In itself, the idea of a fuel-oil and coal mixture is not new. A patent was registered more than a century ago. However, it must be agreed that research was slowed down, then stopped, with the dazzling progress of petroleum. That lasted until the 1973 oil crisis. Fuel-oil supplanted coal in most electric power plants, in industrial facilities, and in home heating. Since then, things have changed. The price hikes for crude oil and, conversely, the profusion of coal reserves (four times greater than those of petroleum estimated at 82,625 GtOE) have led oil companies, and specifically the BP group, to undertake research to substitute coal for petroleum.

A Stable Product

The BP process produces a highly stable fuel-oil and coal dispersion that can supply existing facilities designed to be supplied by fuel oil. The fuel obtained is a mixture composed of 60 percent fuel-oil and 40 percent coal without any additives. The BP process avoids instability of the mixture by eliminating the phenomena of particles settling from the coal. Until now, the various mixtures developed suffer from the formation of a coal deposit that continuous agitation does not allow to be completely avoided. That is why a certain number of additives and surfactants, or "stabilizers," are often used. The major problem: decrease of the competitiveness of the product compared to fuel-oil, the competitor that is to be eliminated.

The BP fuel-oil and coal dispersion is obtained by a double crushing of the coal which brings the coal particles to a maximum size of less than 20 microns, which means that the new fuel does not need to be agitated. Tests have shown that it remained stable for 21 months in normal storage at various temperatures. Generally, the BP dispersion is stored at a temperature below 50°C and it can be pumped and handled at 60-70°C. The temperature

level to be reached in burner systems ranges between 130 and 160°C. Finally, the stability of the mixture remains intact during transporting, both in tank trucks and in trains or ships. We are told that the new fuel does not require extensive transformations in the area of storage facilities. Only some minor adaptations not requiring costly investments would be involved.

At the present time, BP has only made short-term tests because the production of the new fuel did not allow supplying of pilot units for 6 to 12 months. The tests performed have made it possible to draw several conclusions. Technically, the fuel oil-coal dispersion is judged viable. It is thought that boilers designed for the use of heavy fuel-oil can operate with a 100 percent efficiency using the new fuel. However, long-term tests should make it possible to identify problems such as corrosion, dust removal, and cinder formation on the superheater.

The latter problem is the result of the use of coal as such. Tests now under way should make it possible to determine which coals reduce cinder retention in the boiler.

Towards Marketing

In any case, the results obtained have been judged sufficiently promising for the group to begin marketing. At present, the fuel is produced at West Thurrock, Essex, in Great Britain. But BP is having a 100,000 t/year unit built, at West Thurrock also, which should go into service in August 1982. The total investment devoted to the entire fuel oil-coal dispersion project will then be 30 million pounds sterling.

The purpose of the fuel oil-coal dispersion is not to compete with coal. It is a substitute for heavy fuel oil. Its development has a double purpose: diversification of energy and cost reduction. In order for the new fuel to be competitive there must be a differential of $100 per tOE between the prices of fuel oil and coal. Which means that the fuel oil-coal dispersion is based on the hypothesis of a moderate increase in coal prices. In the opposite case, it could join the ranks of impossible products!

BP is planning to market in 1985 in the British, Belgian, Dutch and northern French markets. Marketing would require the construction of production plants at that time with a minimal capacity of 2 Mt/year in Europe, as well as in North America and in Japan.

9969
CSO: 3102/426

COAL BOARD SETS UP GASIFICATION COMMITTEE, FIVE-YEAR PROGRAM

Paris L'INDUSTRIE DU PETROLE GAS-CHIMIE in French Jul-Aug 82 pp 70-71

[Article: "Creation of a Gasification Committee at the Coal Board."]

[Text] A direction committee for gasification has just been set up within the [French] Coal Board for the purpose of:

--defining and proposing an ex situ gasification policy;

--monitoring the application of this policy as well as the study and execution of projects which result from it.

The committee will propose the operator for each project, as well as allocate the necessary means. The operator could be CDF [French Coal Board] Chemical, CERCHAR [French Coal Board Study and Research Center] or a [coal] field.

The following are members of the committee which is presided by Dubost, Director of Coal Industries for the French Coal Board:

--a representative of each of the fields involved;

--a representative of CDF-Chemical;

--the director of CERCHAR.

The existing gasification techniques, like those being developed, are poorly adapted to the gasification of secondary products of which there will be an excess in the French fields in the future.

Therefore, the Coal Board has decided to conduct, in association with GDF [French Gas Company] and EDF [French Electric Company], a program for the adaptation of an oxygen gasification technique for these products.

This program involves:

--preliminary tests at the pilot plants of the promoters of the new processes (Texaco, Wastinghouse, Institute of Gas Technology, Lurgi);

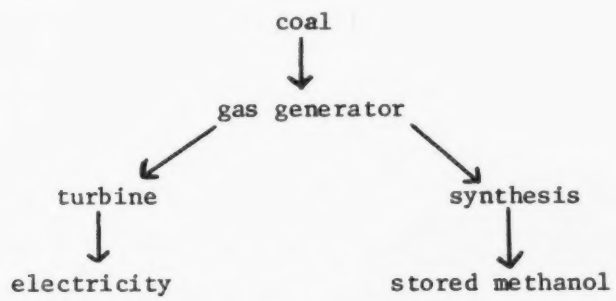
--choice of the most economically promising technique, taking into account the terms of the possible agreement with the process owner;

--the design, construction of a large industrial pilot (200 to 400 t/day), then tests and possible modifications.

This important program will extend over a minimum of 5 years.

Let us recall that, at the same time, the French Gas Company and the Coal Board group propose to construct industrial units for coals using processes currently tested. In cooperation with French Electricity Company, the Coal Board group is also studying new techniques for electricity production. The thinking of both the French Electricity Company and the French Gas Company results in the same conclusion: considering the structure of demand, the most economically viable way to consume coal is the use of gas turbines, with or without heat recovery, by a boiler feeding a steam turbine (depending on the planned length of use). The current method, 600 MW units, seems to be too costly in investments (especially if desulfurization of the smoke is required), and lacks flexibility, despite the technical miracles accomplished. These turbines would be supplied either directly with gas from the gas generator or by methanol, also from this gas produced from coal.

EDF and CDF have, therefore, decided to conduct jointly their economic studies of a mixed system:



The largest investment, the gas generator with its gas treatments, will be used on the basis of 8,000 hours per year. As seen above, it could transform by-products into more convenient energy carriers.

In addition, CDF is studying the construction of a 150 MW TAG-TAV [Gas Turbine-Steam Turbine] electricity unit supplied by a first- or second-generation gas generator.

9969
CSO: 3102/426

KRUPP TO EXPERIMENT WITH MATERIALS IN SPACE

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
6 Aug 82 p 7

[Article: "Krupp To Investigate Material Properties in Space"]

[Text] Fried. Krupp GmbH, Essen. Krupp believes that 30 September 1983 can become an important date in the history of space research. On this day the first manned space flight with the space laboratory "Spacelab" will be launched. Since 1973 the FRG and nine other Europeans countries have participated financially in this laboratory which was developed through the joint effort of the American and European space agencies, NASA and ESA. The preparatory phase of the program," Technological Experiments Under Weightlessness" (TEXUS) has been underway since 1976. In this phase to date, there have been six unmanned rocket flights with experimental payloads which experienced microgravitational fields of less than .001 g during parabolic flights lasting about 6 minutes.

The Krupp Research Institute, Essen, is also participating in Spacelab utilization. At present, experiments from the field of materials technology are being readied which will be finished just in time for launching and will be sent into space as experiments aboard Spacelab. Information gathered from the tests will be of use later in developing new concepts in materials technology and in process and facilities technology under terrestial conditions.

Weightlessness is a phenomenon which can be realized on earth for only brief intervals during free fall. Therefore, due to the weightlessness which prevails there, experiments in space have the advantage that in liquids (inmelts) no gravitational segregation or thermal convection is present.

According to company information, the Krupp experiments include four technical fields: 1. The intermetallic manganese-bismuth compound is a magnetic material of high coercive field strength. Upon solidification of the melt under earth's gravity, the two materials separate forming MnBi seams on a primary manganese precipitate; thus, the alloy forms with difficulty. Under weightless ness on the other hand, a finer grain structure is formed with a greater MnBi fraction and better hard magnetic properties.

2. Mechanical properties of materials are largely determined by the type, quantity and distribution of inclusions. They contribute to both bad and good properties, for instance fracture failure a6d increased hardness (dispersion hardening). Also important is knowledge concerning the relation between the solidification process and the behavior of inclusions. A model system for studying this relation consists of finely powdered alumina suspended in molten copper. On earth, the system separates immediately due to the large d.fference in density between Al_2O_3 (alumina) and copper, but this is not the case under weightless ness, however. In this state under specific conditions one can determine the solidification speed at which the alumina particles cease being pushed away and start being incorporated into the growing copper crystals.

3. Metallic foams, which could be produced direclty from melts, would have in addition to good acoustic isolation properties also higher strength than those made by powder metallurgy. The high density difference between gas and metal appears to hinder the production of foams from melts. Experiments under weightless ness have shown, however, that the absence of surface elasticity in metal melts, especially steel melts, lowers foam stability. This, according to Krupp, leads to completely new process requirements for the production of metallic foams.

4. The heat conducting capability of metal melts can be determined only approximately under terrestial conditions since disturbances by convection cannot be avoided. This value is, however, very important for the design and operation of metallurgical facilities. For this reason, a compact measuring cell was developed for Spacelab which in the absence of convection permits very accurate measurement of the heat conducting capability of melts up to 600 degrees C, reports the Essen firm.

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CSO: 3102/430

BRIEFS

CERAMICS RESEARCH ACTIVITIES--Numerous ceramics are used as passive components: Capacitors, ferrites, protection elements of the thermistor of varistor types, piezoelectric ceramics, etc. The manufacture of these materials passes through various steps, the final properties only being produced after a sintering operation, involving thermal treatment as a function of time and under a controlled atmosphere. The mechanisms of sintering are not very well known, and the development of sintering depends on methods which ar still largely empirical. One of the tools permitting better definition of the sintering process is dilatometric analysis, which consists in establishing dilation-contraction curves as a function of the temperature. A study partially subsidized by the DGRST [General Delegation for Scientific and Technical Research] is in progress at the STQ department (CNET [National Center for Telecommunications Studies]-Lannion B). It consists in imposing on the ceramic not only a sintering cycle expressed conventionally in termsof a temperature-time cycle, but also a contraction-time cycle, this being done with a dilatometer developed at the laboratory and coupled to a computer which automatically controls the kiln and provides for acquisition and processing of data. The motivation is twofold: Better mastery and better comprehension of ceramic sintering mechanisms. The dilatometer, on which a patent application has been filed, is now operational. For traditional measurements as well as for controlled-rate sintering operations, the new dilatometer outperforms the commercially available equipment. The first controlled-rate sinterings were carried out in December 1981. Only two other laboratories have explored this route up to now: One at the University of Raleigh (United States), the other at Riso Laboratory (Denmark). [Text] [Issy-les-Moulineaux L'ECHO DES RECHERCHES in French Jul 82 p 61] 9828

AUTOMATED STEEL CROPPING--AEG-Telefunken, Frankfurt/Berlin. In order to be able to reduce the steel industry's conventional cropping allowance at the beginning and end of steel strips, AEG-Telefunken developed the cropping shape determination system, GEACUT. The contactless optical/electronic system utilizes the radiation from the material at rolling temperature and permits not only the recognition of the end shapes and a fully automatic shearing operation but also the determination of optimal cutting lengths, resulting--according to the firm--in higher productivity than before. In addition, the new acquisition system continuously determines the position of the optimal cutting line with respect to the shear axis, measures the speed, width and strip length of the rolled material, and displays the end shapes ona CRT. According to company information, the GEACUT system uses two diode line cameras whichdetect the surface of the rolled material in the rolling and transverse directions. From the two camera signals, the evaluation unit generates a picture of the strip's end shapes. In accordance with a predefined decision matrix, the positions of the optimal cutting lines as well as their distances from the ends of the strip are determined. These data re input to the shear control as position reference values for the cropping cut. The result is a fully automatic shearing operation. [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 10 Aug 82 p 5] 9160

CSO: 3102/430

BRIEFS

FRG RESEARCH MINISTRY REORGANIZES--A reorganization of several task areas of the Federal Ministry of Research has been announced by Minister Andreas von Buelow in Bonn. An independent new division has been established to accommodate the increasing importance of research and development in the area of rational energy use, especially the use of coal and the renewable energy sources. The advancement of biotechnology, medicine and environmental research will be brought together with research for humanization of the work place in a division restructured along disciplinary lines. Technical communications, microelectronics, manufacturing technology, information processing and innovation will be grouped with the objective of increasing support for these key technologies. An organizational unit shall concern itself with improving the transfer of research results to business, primarily in favor of small and medium-sized businesses, and continuously push for simplified subsidy and reporting procedures for these target groups. "With these measures, the organizational framework for redirecting research policy will be created," explained von Buelow as the objective of this reorganization. The organizational changes went into effect on 1 May 1982. [Essen ELEKTRO-ANZEIGER in German no 10, 1982 p 6] 9160

CSO: 3102/438

REVIEW OF CIVIL AERONAUTICS RESEARCH IN SWEDEN

Stockholm TEKNIK I TIDEN in Swedish No 2, 1982 pp 8-9

[Article by Ulf Edlund and Anders Gustafsson]

[Excerpts] STU (National Board for Technical Development) has a new program for civil aeronautics research including investments of 5.8 million kronor in 1982/1983 and 6.5 million kronor in 1983/1984. The purpose of this program is to establish and maintain a level of expertise that will allow the Swedish civil aeronautics industry to cooperate with foreign aeronautics industries and participate as a partner, subcontractor, or principal contractor in commercially interesting civil aeronautics projects. One general goal is to guarantee the long-range development of expertise. In this article Ulf Edlund, Saab-Scania, and Anders Gustafsson, FFA (National Aeronautics Research Institute) describe civil aeronautics research in Sweden.

Reasons For Increased R&D Investments

The Swedish aeronautics industry's ambitious and single-minded investment in the civil aircraft market may be of great importance to Swedish employment and exports.

The aeronautics industry is investing heavily in aircraft development. For these industrial efforts to be successful, it is especially important that they receive support from goal-oriented research and development at research institutes and technical universities.

The new airplanes that will be developed to be sold in the future must be designed for a market with requirements that are quite different from those of today. This is true of the rapidly increasing fuel costs relative to other operational expenditures and of increased demands for environmental protection, comfort, and reliability.

At the same time, continuous technological development is underway in various fields such as aerodynamics, materials technology, engines, etc. increasing the potential for designing more efficient airplanes for the transportation market of the future.

Thus, in the future, we may assume that airplanes will be available with much higher fuel efficiency, safety, and comfort than the aircraft of today. Much progress has been made in recent decades. The research that is being done today forms the groundwork for the technology that will be applied in the airplanes of tomorrow.

Because of the fierce competition in the industry, new technology is introduced rapidly. The manufacturer who is most able to apply the new technology probably will be most successful. Thus, the challenge today is to study and further develop technological advances to the point that it will be possible to integrate them into the design of new airplanes.

How Profitable Is R&D?

It is difficult to quantify the profitability of research and development. In addition, it is difficult to demonstrate who profits from them: the manufacturer, the airline, or the traveler. In a market with strong competition, however, it is reasonable to assume that eventually everyone profits from technological improvements.

For the industry's ability to hold its own in heavy competition, however, it must be able to deliver an airplane that will be more profitable to the airline than a competing airplane. Both the total cost and the relationships among the various cost categories are of interest and are affected by the technological level of the airplane. Figure 6 illustrates the various components of the take-off weight of an airplane, how the airplane's price is related to the various systems, etc., and the various items included in the direct operating costs of the airplane. (The example applies to an airplane whose weight and operating costs are assumed to be constant during the depreciation period of the plane, but the relationship between various items may vary.)

Since fuel costs are a considerable percentage of the direct operating costs, even as shown in part C of the figure, it is easy to see that a higher initial price is permissible for an airplane with lower fuel consumption. Diagram A in the figure shows that reducing the structural weight and/or reducing the fuel load (due to lower consumption) makes it possible to increase the paying load. The relationships shown in the figure may be used to determine the profitability of technical improvements in the following manner:

If fuel consumption can be reduced by 1 percent and half the resulting decrease in fuel load can be converted to paying cargo, then the prototype costs may be allowed to increase by about 20 percent, thereby increasing the cost of the plane by about 4 percent.

If the structural weight of the plane can be reduced by 1 percent and half of this weight decrease can be converted to accommodate paying cargo, then prototype costs may be allowed to increase by about 35 percent.

For a large turboprop plane the prototype costs are on the order of 1.5 billion kronor. If the prototype costs are permitted to rise by 20 or 35 percent as indicated above, this would mean 300 and 500 million kronor, respectively, for a 1 percent decrease in fuel consumption or structural weight. These figures do not take into account the need for returns on the investment, the investment risk, etc., which naturally influence any decision in practice.

The examples indicate, however, that research and development and the resulting technological improvements can be extremely profitable.

Direction Of R&D Investments

Obviously, a small country such as Sweden cannot afford research and development of such magnitude that it would be foremost in all areas of aeronautics. It is just as obvious, however, that if the Swedish aeronautics industry is to compete on the international aircraft market, we cannot afford to ignore important areas of research and development.

Thus, to distribute and prioritize the available research and development resources in the best possible manner, it first is necessary to decide toward which goals (airplane classes, etc.) the research and development should be directed.

Then, based on these goals, it is important to identify vital areas of technology in which Swedish expertise presently is insufficient or totally lacking and begin building proficiency in these areas as soon as possible. In addition, of course, work must continue in areas where our present knowledge is satisfactory.

Because of the long periods of time that often pass between research and application of the results in a specific design project, research must be conducted continually even before concrete airplane projects are drawn up. It is too late to begin basic research just before the results are to be utilized. Thus, much of the research project always must be directed toward basic, general research.

A proposed program for work within certain areas during a 3-year period was developed in 1981 ("A Proposal for Civil Aircraft Technology Research at FFA and KTH 1981/82-1983/84"). When this proposal was developed, it was assumed that in certain areas civil aeronautics could learn from military aeronautics. It should be pointed out that the basic methodology often is the same for the development of civil and military aircraft.

Examples of important areas are presented below. At present, available resources do not permit research and development in all these areas.

Aerodynamics
- calculation methods and test technology;
- development of wing profiles and wings;
- elevator mechanisms;
- propeller slip effects.

Flight Mechanics, Stability, and Flight Characteristics

flight characteristics, simulation;
control system principles;
gust sensitivity, maneuverability.

Structure and Materials

weight reduction by using new materials, composite materials;
methods of calculation for structural analysis;
design solutions, production technology;
dimensioning philosophy, durability.

Noise and Vibrations

noise analysis;
vibration analysis;
cabin noise control

Safety

ergonomics;
flight safety;
crash safety;
design standards and certification.

Support Operations

air traffic control/procedural questions;
ground operations;
maintenance questions.

Engine Technology

engine characteristics;
combustion technology;
control technology;
materials technology;
construction technology.

R&D--Cooperation And Results

Close cooperation between the industry, on the one hand, and FFA and the technical universities, on the other, is vital if we are to achieve the proficiency and capacity necessary to strengthen the future competitive strength of the Swedish aeronautics industry. A research program such as the one described above, of sufficient magnitude, is an important element in this process. Researchers in the field of aeronautics and related disciplines should be trained in such a way that their goals and those of the research and development program coincide. Such cooperation is an important part of the long-range program to develop expertise. The results of the research program may be expressed in the following terms, which will be of vital significance to the Swedish aeronautics industry in its effort to develop and produce competitive civil aircraft.

Methodology in the form of advanced tools for designing and testing that may be utilized in current projects.

Basic data in the form of reports on the application of technology in given areas.

Proficient researchers and technicians whose research and development work in their respective areas has given them expertise that can be applied to current airplane projects and may be used to develop the technology required for future aircraft projects.

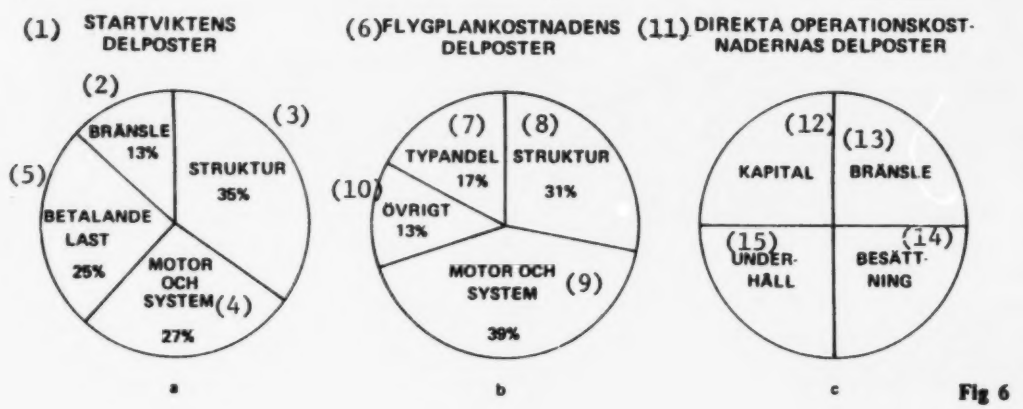

Fig 6

Key to figure:

1 Items included in take-off weight
2 Fuel
3 Structure
4 Motor and systems
5 Paying cargo
6 Items included in airplane cost
7 Prototype development
8 Structure
9 Motor and systems
10 Other
11 Items included in direct operating costs
12 Capital
13 Fuel
14 Crew
15 Maintenance

9336
CSO: 3102/418

LP GAS GROWING IN POPULARITY AS AUTOMOBILE FUEL

Paris AFP SCIENCES in French 17 Jun 82 pp 39-40

[Text] LPG [liquefied petroleum gas] as an automotive fuel in France is now an accepted and competitive option to regular and premium gasolines and Diesel fuel.

LPG has finally come out of Limbo: 750 LPG refueling pumps have been installed in France. There will be 1,000 of them by the end of 1982, and 1,800 within 2 years. The difficult problem of filling up, which has heretore discouraged many automobile owners no longer exists. Every French city now has one or more LPG refueling pumps. The unrefueled cruising range of an LPG automobile is between 400 and 500 km.

The price of LPG--between 2.62 and 2.67 francs per liter--renders its use financially advantageous even though the consumption per 100 km exceeds that of premium gas for the same model of automobile.

As for performance, a series of tests organized by the GEPEL [expansion unknown] (Shell-BP) Company showed the qualities of LPG as an automotive fuel to be comparable to those of premium gasoline with, for added measure, less pollution and less noise.

There remains the problem and the cost of conversion of the vehicle to LPG. According to the oil companies, which are prepared to provide directory information and are training mechanics free of charge, the conversion must be done at a properly equipped shop. It is not a do-it-yourself job, on pain of ending up consuming excessive fuel. The cost of conversion runs between 3,500 and 5,000 francs, whereas a Diesel engine costs between 6,000 and 8,000 francs more than a gasoline engine.

The ideal would be for the automobile manufacturers to accept LPG without further hesitation and to offer models factory-designed to use it. But they remain distrustful and are offering only a few small commercial-type models. The initial cost differential of an automobile designed to use LPG can be amortized after the first 40,000-50,000 km, owing to the cheaper price of the LPG, and LPG automotive production is being addressed mainly to the high-

mileage users, who make up more than half their clientele, the other half being made up of national (PTT, EDF [French Electric Power Company]) and municipal administration vehicle fleets.

LPG makes it possible, however, for demanding motorists to keep a large-engined, comfortable-bodied car without lowering its performance; and a set of LPG equipment can be transfer-mounted from one car to another.

There is an inconvenience nonetheless: The public authorities have, for tax reasons, not authorized a mixed LPG-gasoline fuel. Furthermore, for reasons of safety, the presence of LPG refueling pumps along the highways is prohibited.

If the oil companies are so vigorously pressing the LPG drive, it is because the sale of petroleum gases (LPG is a mixture of 80 to 50 percent butane with 20 to 50 percent propane), by-products of the distillation of petroleum which were formerly flared,can represent a non-negligible revenue. Besides, petroleum gases are becoming more abundant at the refineries, since the development of nuclear energy is reducing the fraction of heavy industrial fuels in the distillation process and is concomitantly tending to increase the production of "white products" (gasolines), which supplies butane and propane in large quantities.

The oil companies are aiming to "Gepelize" 3 percent of the French automobile population, that is, between 450,000 and 600,000 automobiles: As many as in the Netherlands and less than in Italy at this time. For the time being, the French market (around 70,000 vehicles) has at its forefront GEPEL (Shell-BP) with 38 percent of all sales, followed by ELF-ANTARGAZ (25 percent), Total-Gaz (17 percent), PRIMAGAZ (14 percent) and various small companies.

The cost of an LPG pump, installed in a service station, comes to 200,000 francs, and if the oil companies are installing so many of them, it is probably because they believe in the future of gas as an automotive fuel.

9238
CSO: 3102/413

BRIEFS

AIRBUS 310 TEST FLIGHTS--The first Airbus powered by General Electric CF6-80A1 jet engines completed its first flight Thursday at Toulouse. The flight of the plane, the third Airbus A-310 to come off the assembly line and the first to be produced to Lufthansa "standards" (specifications), lasted 5 hours, which were devoted essentially to measurements of performance and to systems tests. The plane flew at cruising altitudes of 25,000 and 35,000 feet. Tests were also conducted to verify that stall-test speeds are identical to those registered by the first two A-310's, which were equipped with Pratt and Whitney engines. Since the start of test flights on 3 April, the latter two planes have completed 103 take-offs and landings on test flights, accumulating close to 340 hours of flying time. According to Airbus Industrie, performance-test results "refute completely the arguments that have been advanced to the effect that both the operating range and the maximum flying altitude of the A-310 would be limited owing to the size of its wing." Airbus Industrie has already booked a total of 102 orders for the A-310, from 17 airline companies. Lufthansa, which has firm-ordered 25 planes, will put the A-310 into operation following certification in March 1983. [Text] [Paris LES ECHOS in French 9 Aug 82 p 8] 9238

CSO: 3102/413

END

JPRS 82034

20 October 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 123

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JPRS 82034

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WEST EUROPE REPORT

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YOUNG GENETIC ENGINEERING FIRM ENJOYS EARLY SUCCESS

Paris LE MATIN in French 16 Aug 82 p 16

[Article by Marie-Ange d'Adler, special correspondent in Strasbourg: "Genetic Engineering: The Great Transgene Adventure"]

> [Text] With two triumphs in 16 months of existence, this small company born of a meeting of French bankers and researchers is in a good position in this new scientific and industrial race. About 10 days ago, a small private company, Transgene, announced a scientific breakthrough: Its researchers had succeeded in getting bacteria to produce a viral particle of the rabies virus (see LE MATIN 3 August). This may constitute the first step toward manufacture of a new vaccine. It is the second triumph for this very young company, which was founded 2 years ago as a result of a meeting between the number two man at the Banque de Paris et des Pays-Bas [Bank of Paris and the Netherlands; Paribas], Robert Lattes, and two French specialists in molecular biology, Pierre Chambon and Philippe Kourilsky. The result was a completely original small enterprise, the only firm backed by private European capital that is dedicated entirely to genetic engineering and that already seems to be in a good position to take on the world competition in this field. This is a novelty for France, where up to now the academics have ignored the industrialists and have had little to do with the world of finance.

A plaque on the sixth floor of a faculty of medicine building reads "Transgene." Here, among the university laboratories, a small private firm has taken up residence. A small firm unlike any other: Transgene is the only private enterprise in Europe that is dedicated entirely to genetic engineering.* This is a small firm that succeeds: After 16 months of work, it already has two achievements to its credit.

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*Genetic engineering is the set of techniques (some of which have won Nobel prizes for their discoverers) that can be used to alter the genetic makeup of an organism and thus its function. Genetic engineering has obvious practical implications, since it can be used to get microorganisms to produce substances useful to man.

The first was with interferon, a natural substance from which it was hoped to obtain a weapon against viruses and perhaps against certain cancers. The second, announced at the beginning of the month, may open the way to a new rabies vaccine. In the scientific and industrial race to use genetic engineering, Transgene seems to be in a good position for the future.

This whole story began about 3 years ago, when Paribas decided to put money into advanced technologies and came to understand the role that "venture capital" (that is, long-term investment) could play in that area. In the United States and Japan there is already a boom in biotechnologies, based on putting living cells to work for mankind. Hardly anything is being done in France. "Yet our country holds some trumps, some researchers who are among the best in the world in molecular biology, and especially in genetic engineering. When we were abroad, we kept hearing certain names mentioned more often than others...," recalls Robert Lattes, research and development director at Paribas. Lattes contacted two French researchers; Philippe Kourilsky, at the Pasteur Institute of Paris, and Pierre Chambon, at the University of Strasbourg. Thus Transgene was born by bringing together a number of unsuspecting parties: five large investors (Paribas, Assurances Generales de France, BSN-Gervais-Danone, ELF [French Gas and Lubricants]-Aquitaine and Moet-Hennessy) and two renowned researchers. Chambon and Kourilsky became Transgene's scientific advisers, but they retained positions in public research organizations where they directed teams working on the frontiers of science.

A difficult problem remained to be solved: In a nation where academics and industrialists traditionally avoid one another, how might Transgene's position at the crossroads of research, industry and finance be defined? The founders arrived at an imaginative solution whereby a 23-percent share of the new company's assets was turned over as a free donation to certain public research organizations: 12 percent went to a group, G 3, that had an economic interest, the Pasteur Institute, CNRS [National Center for Scientific Research], INSERM [National Institute of Health and Medical Research] and INRA [French Institute for Agronomical Research]; 3 percent went to the Louis Pasteur University of Strasbourg; and 8 percent went to a research foundation set up by Kourilsky and Chambon.

This was a means of providing basic research with a guarantee that it would benefit from industrial applications of its discoveries. This was also a means of attracting high-quality researchers. "This structure appealed to my imagination," admits Jean-Pierre Lecocq. A man of 35 with a slight Belgian accent, he is Transgene's scientific director. A specialist in molecular biology, he gave up a position directing the genetic engineering laboratory of a large American firm to come organize the Transgene team in September 1980.

"Applications have poured in from all countries: after only a few weeks we began receiving resumes from more than 200 high-level researchers.... We were able to get started very quickly, and that was important in a field where the competition is lively and where the techniques are evolving very fast," says

Lecocq. Presently, 45 persons work at Transgene, of whom 20 are researchers of eight different nationalities (United States, Great Britain, Ireland, Netherlands, Belgium, Australia, India and France) and 18 are Alsatian technicians.

White laboratory benches and petri dishes, gel columns and centrifuges--the Transgene laboratories look about the same as other labs. Molecular biology does not offer any spectacle. "We work with empty test tubes," jokes Lecocq. "A picogram of product, you can hardly see it."* But he is proud of his team. "We have assembled a tool for work in all fields where genetic engineering is applicable: in pharmaceuticals, of course, but also in the agro-food and chemical industries." With those goals in mind, at Transgene they are working with the entire battery of the various microorganisms and cells capable of being used in genetic engineering. They have also set up a laboratory for chemical synthesis of DNA (the molecule that carries the information controlling the biological function of an organism). This fast-growing technique, which can be used to make artificial custom-designed genes, is in fact opening the way to second-generation genetic engineering.

Sixteen months after startup of the laboratory, Lecocq can feel satisfied. Two successes in so short a time is not a bad start. Although on interferon Transgene arrived a few weeks behind Genentech, the American leader in genetic engineering, Transgene got even by beating Genentech at the wire on rabies.

These two successes have established a pattern. "We have proven that Transgene can provide a link between basic research and industry," emphasizes Lecocq. Indeed, on interferon, the Transgene team did the early work in cooperation with the researchers at the Curie Institute, then concluded a research and development contract with one of the biggest companies in the French pharmaceutical industry, Roussel-UCLAF. On rabies, there was similar collaboration with persons engaged in basic research at the Wistar Institute of Philadelphia, followed by a development contract with the Merieux Institute, a leader in the field of vaccines.

Are there other contracts in the works? On that subject, Transgene is not talking. Even the board of directors does not always know the name of the client and the purpose of the contract: Transgene should be able to work with everyone, including its investors' competitors! But they will nevertheless "admit" that there is another "important" contract with a French firm and that negotiations are in progress with foreign companies.

In short, if Transgene's researchers are pleased, the investors are too. They have furnished a hefty Fr 81 million to keep the laboratory running for 5 years. Already, thanks to the contracts, it has been possible to increase the operating outlays about 25 to 30 percent in constant francs compares with original projections. Therefore, they confidently await the second stage of the financing: the one in which they begin to collect the royalties.

9828
CSO: 3102/424

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*1 picogram = 10^{-11} gram.

PREUSSAG TO EMPLOY BACTERIAL LEACHING OF ORES

Bonn RHEINISCHER MERKUR in German 20 Aug 82 p 13

[Article by Harald Steinert: "Reviving Tired Mines"]

> [Text] Microorganisms are to increase the yield of a mine on the northern edge of the Harz Mountains. Preussag wants to get an additional several tens of thousands of tons of zinc and copper from Rammelsberg--using microbes.

West Germany's mining technology is now employing a new mining method: For the first time, "bacterial leaching" is to be used in the procurement of nonferrous metal. With the help of this method, the idea is to mine those residual ores which can no longer be obtained with standard mining technology at the world-famous "Rammelsberg" near Goslar. Preussag--the owner of the deposit--has already pushed the development work very far and, in the context of the raw material research program of the Federal Ministry of Research and Technology, hopes to get between 1 and 2 million tons of ore there with the help of microorganisms. "Getting" in this case means "extracting the metal content from the rocks" because the micro-miners separate the metals out of the rock without any need to move the dead rock.

Methods of "bacterial leaching" of ores are widespread today. In general one of course uses existing bacteria, such as "Thiobacillus ferrooxydans," which live in the clefts and cracks of ore-containing rocks and multiply there. By virtue of their metabolism, they generate very high degrees of acidity in the seepage water of the deposit and dissolve most of the ores consisting of sulfides (sulfur compounds) in that they oxidize the sulfur into sulfuric acid. Paradoxically, the method is called "bacterial leaching" in German although it does not work with lye but rather with acid.

Microbe activity is partly being used in already mined ore piles or in metal-rich waste dumps but it is partly also used in the "solid, existing" ore, in other words, in the rock itself--in this case, the method is called "in situ leaching," in other words, "leaching on the spot." Using this bacterial method, about 0.2 million ton of copper is already being obtained per year in the United States at this time (about 12 percent of the country's copper output). This method is also being used in the Soviet Union, in Australia, and in France (where it is employed for uranium extraction). In the

FRG, the Federal Institute of Earth Sciences and Raw Material in Hanover has for quite some time now been experimenting with this type of metal extraction. This effort is aimed especially at the extraction of copper from the big, underground copper slate fields, for example, in Hesse, where there are metal deposits going into the millions of tons. The ore strata however are partly so deep or are so poor in metal that conventional mining, with shafts and galleries is not worthwhile. The idea is to drill into those strata, infecting them with microbes specifically bred for copper slate, and to get the microbes to separate the metal out; the metal then only needs to be pumped to the surface and that is a very attractive idea. Of course, the practical implementation of such undertakings is still rather remote.

Professor Wilhelm Schwarz at the Braunschweig Technical University (Microbiology Institute) is pursuing a somewhat different project. He is trying to use bacteria for the separation of ores, bacteria which do not live on sulfur oxidation (like the sulfur-oxidizing bacteria in the nonferrous metal deposits) but which need other energy sources, for example, organic carbon compounds. Such "heterotrophic" bacteria must be fed constantly if they are at work in the ore deposit. They work there by generating other, weaker acids (such as citric acid and oxalic acid) and with these acids they dissolve other metals than the oxidizing bacteria.

The researcher is thinking of using these microorganisms to get very high-grade metals, such as uranium, or the mining of "silicadic" (silicic-acid-containing) nickel ores. This kind of microbial leaching of course becomes much more expensive because one must keep supplying the bacteria with food. Even if one uses the cheapest waste products, such as sulfite waste lye, one must make sure that the objective of this extraction effort will be worth the expenditure. The method is still being developed at this time.

The first use of microbes in German mining was not the result of the desire to gain primarily metals but rather sprang from environmental concerns. Rammelsberg, the oldest metal ore mine in Central Europe (apart from the copper mining operation on Helgoland during the Bronze Age), in operation for more than a thousand years, is almost exhausted today. A part of the deposit, the so-called "old deposit," where mining operations have been going on since the Middle Ages, has been abandoned already since the middle of last century. And mining operations are still going on in the "new deposit" but it will contain not a single ton of ore at the latest within 7 years. But the mine waste waters continue to flow.

These mine waste waters--in other words, the seepage water which penetrates the rock from the surface and which goes through the cracks and clefts, the shafts and galleries throughout the entire mountain--is still acid and metal-containing. The sulfide-devouring bacteria, which oxidize the ore, which forms sulfuric acid, and which dissolve metals, discovered this interesting source of food called "Rammelsberg ore" already many centuries or even thousands of years ago and they have settled down wherever the water, which carries oxygen, can penetrate.

These bacteria in other words have been at work already since primeval times. Because of that, the mine waters, which flow out of the mountain, perhaps at

the rate of 150 liters per minute, today contain several grams of zinc and up to 200 milligrams of copper per liter--not enough to extract these metals but too much to allow the acid waste waters to flow unhindered into the water network after the abandonment of mining operations in Rammelsberg. This is why there has been a search for efficient possibilities for quite some time in order in the future to be able to collect these mine waters and to purify them. Preussag researchers got the idea of enriching the already metal-containing outflow with metal to such an extent that metal extraction would be worth the trouble.

For this purpose, the acid waters are to be caught and then again to be allowed to seep into the mountain, specifically, where as yet unmined ore remnants are suspected. This primarily involves the "old deposit" which was mined without any accurate mine surveying and mine charts. Here we still have the ore pillars between the dead rock which contain valuable metals; here we still have collapsed ore portions and here the old miners allowed ore to remain because it looked unprofitable to them since it perhaps contained too little copper and silver and too much zinc.

This "old deposit," which has been heavily mined in earlier centuries, represents ideal settlement terrain for the ore-extracting microbes. If metal-containing solutions are piped into the promising portions of this deposit, the microbes would have to supply additional metal quantities--assuming that one can give them an incentive "to work" and assuming that they will become more intensively active than normal. This incentive would have to come from the supply of oxygen. Just exactly how this is to be done is as yet not clear (by means of compressed air, oxygen, or through the water) and this is also a problem which must first be solved during the research and development project which "Preussag" has launched.

For a time, researchers also experimented with various bacteria strains in the hope of finding particularly hard-working mining types with which one could infect the ore. Such breeding experiments however were abandoned because it turned out that the bacteria, living by nature in Rammelsberg, are very well adjusted to their environment and are doing their best already in separating ores and in working on metal extraction. And so the microbes already living in Rammelsberg will be hired for service with Preussag.

The hoped-for metal volumes by no means are small: The ore on the average contains about 11 percent zinc, 5 percent lead, and 1 percent copper, so that the 1-2 million tons of ore, which the company hopes to extract with the help of microbes, could yield several hundreds of thousands of tons of zinc and several tens of thousands of tons of copper. The entire extraction effort at Rammelsberg today amounts to only about 270,000 tons per year. The "in situ leaching" process presumably will extend over a whole series of years, perhaps even decades.

In addition to the advantage of useful water management in its mine, which is to be closed down in a few years anyway, Preussage hopes that the project will yield extensive know-how in a technology which would seem to assume rising significance in international mining and which could also be used in other ore deposits owned by Preussag.

5058
CSO: 3102/444

COMPANY FOUNDED IN SCOTLAND TO PRODUCE IC'S CHEAPER, FASTER

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
30 Aug 82 p 7

[Article: "Integrated Circuits Faster and Cheaper"]

[Text] Lattice Logic, Edinburgh--The steps from design to production of integrated circuits can be organized for greater speed and economy in the opinion of this newly founded Scottish company. Lattice Logic will offer products and services to this end. The company's first product is a production aid for a CMOS group-gate circuit which, according to company sources, is the first silicon compiler for group-gate circuits. A highly developed structural concept offers the basis for more efficient development of complex electronic circuits. Lattice Logic was founded by Dr John Gray who was leader of the Silicon Structures Project at the California Institute of Technology from 1978 to 1980. The company will be jointly financed by Technical Development Capital and Eastern Scottish INdustrial Investments. It is expected that the first CMOS group-gate circuit will be produced at General Instrument's integrated-circuit factory located at Glenrothes New Town.

The new company calls its most important service "silicon brokerage." This service makes it possible for users to share the costs of a complete production cycle of a standardized IC process even though their individual circuit designs differ. In this manner, the cost and time for developing prototypes, for example, can be significantly reduced. This is the first service of its type in Europe. In September the company will conduct its first formal course in VLSI circuits. In this course, engineers will be given the opportunity to design their own LSI components using Mead and Conway's structure-specific design methodology for NMOS components.

Lattice Logic expects this year's sales to come to $400,000. Dr Gray is convinced that sales will exceed $10 million within 5 years. Even though small-lot production of special circuits presently amounts to only 1 to 2 percent of total production volume, Lattice management expects such special designs to reach 10 percent of production inside of 2 years.

9160
CSO: 3102/442

BRIEFS

IMPROVED CMOS TECHNOLOGY--The "stacked transistor CMOS" technology, by means of which P-channel transistors are fabricated on polycrystal silicon and located on N-channel transistor grids, was recently improved by a "selective" laser annealing technique. The latter consists of cutting, with conventional photomasking, a silicon nitride anti-reflection coating on top of zones in which the polycrystal silicon is to be remelted during the laser annealing. Inverters have also been made at CNET-CNS (National Center for Telecommunications Studies), whose P-channel transistors have channels shorter than 4 microns. Hole mobility reaches 120 $cm^2V^{-1}s^{-1}$, which is one-third the mobility in single crystal silicon. The leakage current of these transistors is of the order of 10 pA per micron of junction, a value that guarantees this technology one of the major advantages of CMOS, low electric consumption. The inverters fabricated operate a supply voltages between 2 V and 20 V. [Text] [Issy-les-Moulineaux L'ECHO DES RECHERCHES in French Jul 82 p 60] 11,023

FRENCH FLAT-PANEL DISPLAYS--As part of a study of flat-panel integrated screens, conducted at CNET-Lannion B (National Center for Telecommunications Studies), the TIC department is currently developing an MOS technology with amorphous and polycrystal silicon on large size glass substrates, as well as studies on electrochrome materials as passive electro-optic transducers for several colors. The first stage will result in the achievement, in 1982, of a high-definition (16 points per square-mm) flat screen with 320 lines and 320 columns on an area of nearly a square-dm. Each dot on the screen will consist of an amorphous silicon transistor which will excite a twisting nematic liquid crystal. The objective of the second phase of the project will be to integrate the vertical and horizontal shift registers with a polycrystal silicon MOS obtained by the dynamic annealing of amorphous silicon. The last phase will consist of combining polycrystal silicon transistors with the electrochromic materials studied in the laboratories of the department, so as to facricate a flat video screen with several colors. [Text] [Issy-les-Moulineaux L'ECHO DES RECHERCHES in French Jul 82 p 60] 11,023

USE OF MICROELECTRONICS ENCOURAGED--TN. Frankfurt, Sept 1. The Government is providing an annual subsidy of DM 450 million for a special program to support microelectronics applications in small and medium-sized companies. The first statistics relating to the requests made by industry to date for

Government support are now available. According to Government information provided at the request of Member of Parliment Boernsen, the bulk of the proposals relate to instrumentation and control technology and its application to the energy conservation problem. About 50 percent of the proposals came from this area; about 25 percent from the narrower field of information processing and about 5 percent each from the areas of automobile, household and medical equipment. The Government believes that it has achieved its goal of supporting mostly small and medium-sized companies in the innovative application of microelectronics. According to an initial analysis, more than two thirds of the proposals were submitted by small and medium-sized companies. About 20 percent of the companies are less than 10 years old. Fewer than 10 percent of the proposals came from companies with annual sales of more than DM 500 million. According to information available to date from the companies, at least 20 percent of the proposing companies plan to hire additional development personnel for the projects. [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 2 Sep 82 p 7] 9160

CSO: 3102/442

TEST OPERATION OF GROWIAN TO BEGIN IN EARLY 1983

Frankfurt/Main ELEKTRIZITAETSWIRTSCHAFT in German 7 Jun 82 pp 363, 383-84

[Interview with Director Dipl Eng Manfred Brohmeyer, chairman of the Board of Schleswag AG, Rendsburg, by the editor of ELEKTRIZITAETSWIRTSCHAFT: "Growian on the Test Stand--Large Wind Energy Plant Expected To Take Up Test Operation in Early 1983"; on 16 June 1982 on the occasion of the membership meeting of the Association of German Utilites--VDEW e.V.]

[Text] [Question] A few weeks ago, assembly work was started on the site of the Large Wind-Energy Plant ("Growian," for short) in Kaiser-Wilhelm-Koog, Brunsbuettel. This implies that that plant is nearing completion. Can you give some details as to the progress of construction?

[Answer] If everything continues to go according to schedule, the most difficult and at the same time the most interesting stage of project construction will start in September. The 375-ton equipment room has to be hoisted into its final operating position some 100 m in the air. Completion, including the final functional test, of the individual systems is scheduled for late fall of 1982 so that the 6-week trial run can probably start in early 1983.

[Question] The purpose of the project has been the subject of extensive public discussion. What are the tasks and aims of the Growian research project?

[Answer] The Growian Construction Operation research and development project for the purpose of power generation is part of the energy research program of the Federal Ministry for Research and Technology, which bears the full costs of the erection and a major portion of the cost of research operation of the project. Our company is responsible for the erection, the operation and the testing of the Growian wind-energy plant as a prototype.

The purpose of the project is to determine the actual cost of the construction and operation and the power output potential of the given wind-energy supply. Standards for the evaluation of the technical feasibility and the performance, particularly in system operation, can only be found in real practice. This also applies to the economic feasibility of power generation by large wind-energy plants.

Another aspect to be examined is the wind at this height and its characteristics. The two rotor blades, which total 100 m, are assembled almost 100 m up in the air. Throughout the world no such data exists.

[Question] What finding is the test operations expected to come up with?

[Answer] The test operation, which will probably comprise a period of 3 years, is to yield findings by means of which the technical problem of large wind plants and their energy efficiency can be better understood. Comprehensive tests are geared toward detecting the wind parameter in various altitudes, the plant output, loads, performance of the power system, and management.

Experts will also be interested in the connection of the 3-MW generator to the existing medium-voltage system and the performance during operation.

The standard operation should present no problems.

But how will the wind-energy plant react in the event of failure? Tests have already shown that the wind-energy plant has to be resynchronized with the system every time there are "short failures" in the medium-voltage system.

[Question] The three utility companies Hamburgische Electricitaetswerke AG, Schleswag AG and Rheinisch-Westfaelisches Elektrizitaetswerk AG are taking part in the construction and operation of Growian. You just said that the costs of the project are borne by the Federal Ministry of Research and Technology. Why did these utility companies participate in the project?

[Answer] To answer this question, I have to go back a little. In 1977, the Ministry of Research gave a research grant to industry to produce plans for a 3-MW wind-energy plant ready for construction. The hub of the plant was to be 100 m in the air in order to collect data on such a plant at this height.

Upon completion of the study, the ministry was looking for a company that would be and was capable of being responsible for the construction and operational management of such a plant.

That is how in early 1980 the above-mentioned three utilities together founded a company called Grosse Windenergieanlage Bauund Betriebsgesellschaft mbH, to implement the construction and the research operation thereafter.

[Question] In the past discussions there have been vast differences with respect to the quoted costs of the Growian project. The latest figures are around DM 90 million. What does this sum comprise?

[Answer] The sum of DM 90 million contains all costs incurred in connection with the Growian project. DM 8 million are for preliminary studies and tests alone. The construction costs for Growian and the three wind-measuring poles alone are DM 68 million. This sum includes the cost increases and charges incurred during the planning and construction phase. The steel beams of the wings, for instance, had to be extended into the wing tips for rigidity, causing additional costs. Another DM 14 million approximately have been budgeted for the operation, management and implementation of a wind-measuring program.

It must be kept in mind that Growian is a prototype. Indeed, it is our objective to determine the actual costs and test the possibility of series production.

If produced on the assembly line, Growian would certainly turn out to be considerably less expensive. It is understood that the costs of development and manufacture of a prototype are above average.

[Question] What are the expectations with respect to this installation according to the latest findings?

[Answer] The Large Wind-Energy Plant is designed such that it starts up at wind velocities of 6.3 m/s and over (approximate wind velocity 4). At 12 m/2 (wind velocity 6) the installation reaches its nominal output, and at 24 m/s (wind velocity 10 to 11) it must be shut down. The generator at an altitude of 100 m is to have a 3,000-kW output in favorable wind. Over the year this corresponds to 12 million kWh of electricity. The assumption was that during some 27 percent of the year the nominal output would be reached, and less than the nominal output during another 50 percent of the year, i.e., during one-fourth of the time the plant would be idle due to either too little or too much wind.

Technically, however, this annual output is sufficient to cover the annual requirement of 250 single-family homes, including heating. Also, 4000 households could be supplied with power, or 3.5 million liters of heating oil of an oil-fueled power plant be saved. However, as the wind does not blow all the time, power plants have to guarantee the power supply on those days without wind, as specified by the Energy Act.

Incidentally, Growian will operate without any envirionmental impact. Only the rotation of the rotor blades produces a noise, and that is comparable to that of a glider.

[Question] Newspapers frequently report on foreign wind-energy plants. In the FRG, however, the utilization of wind energy is not discussed in public very much. Can we therefore conclude that other countries are undertaking greater efforts to utilize wind energy to generate power?

[Answer] No! The FRG has a long tradition in this respect, particularly northern Germany. The Hamburgische Electricitaetswerke and the Schleswag AG did research in the field of application of wind-driven generators in cooperation with manufacturers as early as in the period from 1949 to 1954.

First experience was gained by a test plant in Buesum equipped with a 9-kW generator. This experiment was utilized in the construction of a 100-kW plant which went into operation in Stoetten, Swabian Alb, in 1960.

The GKSS Research Center Geesthacht has been gathering experience with several smaller plants in Pellworm, a North Sea island. The plants are 9 and 12 m high and generate a maximum output of 10 kW each.

In recent years, however, several large plants were erected abroad. The two plants in Denmark near Nibe on the Lumfjord, for example, have a 630-kW output each and are approximately 45 m high.

Several large plants generating 1.5 to 2 MW from wind are located in the United States.

With its 3-MW output and a hub height of 100 m, Growian exceeds all existing wind-energy plants. As we have no experience on this scale so far, we have to undergo expensive research and tests.

The final word regarding the success of the plant will not be spoken until 3 years of research and operation have been completed. Then more data will be available to predict the future of economical utilization of wind energy.

9544
CSO: 3102/429

KRUPP INTRODUCES ENERGY-EFFICIENT, LOW TEMPERATURE FURNACE

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
26 Aug 82 p 7

[Text] Krupp Handel GmbH [Incorporated], Essen. According to company sources, Krupp has developed new, low-temperature heating boilers based on a forward-looking design. They are being offered under the designation "opti-cal" GOR and GOR-TS in seven structural sizes. The new gas-oil special heating boiler supposedly operates in the low-temperature range in a sliding manner without a lower temperature limit and is thus very energy-saving. In the combustion chamber, we have the cylindrical noble-steel combustion chamber which has been tested for the past 4 years and which reveals radially arranged rib-like section steel pieces (see photo). They become hot immediately during burner operation so that the combustion chamber reportedly always remains dry. No condensate is supposed to form even at low boiler-water temperatures and this means that there is no corrosion either. Krupp has given the combustion-engineering efficiency at about 92 percent. Because of the sliding operating mode, radiation losses (less than 1 percent due to good installation) and operating readiness losses are so small that--according to Krupp--we get an extremely high annual efficiency with more than 85 percent.

The built-in electronic and fully-automatic regulating component--it detects, regulates, and saves--makes sure that the boiler will be operated at the temperature that corresponds to the heating system and the purpose of the operation. It regulates and thus minimizes heat generation for heating purposes and hot-water preparation. The boiler temperature is regulated in a sliding manner by means of the weather sensor. The weather-dependent regulator has two outputs. One of them controls the burner and the other one controls the thermal drive. For subsequent or follow-up regulation, it is possible to connect a mixing valve with thermal valve.

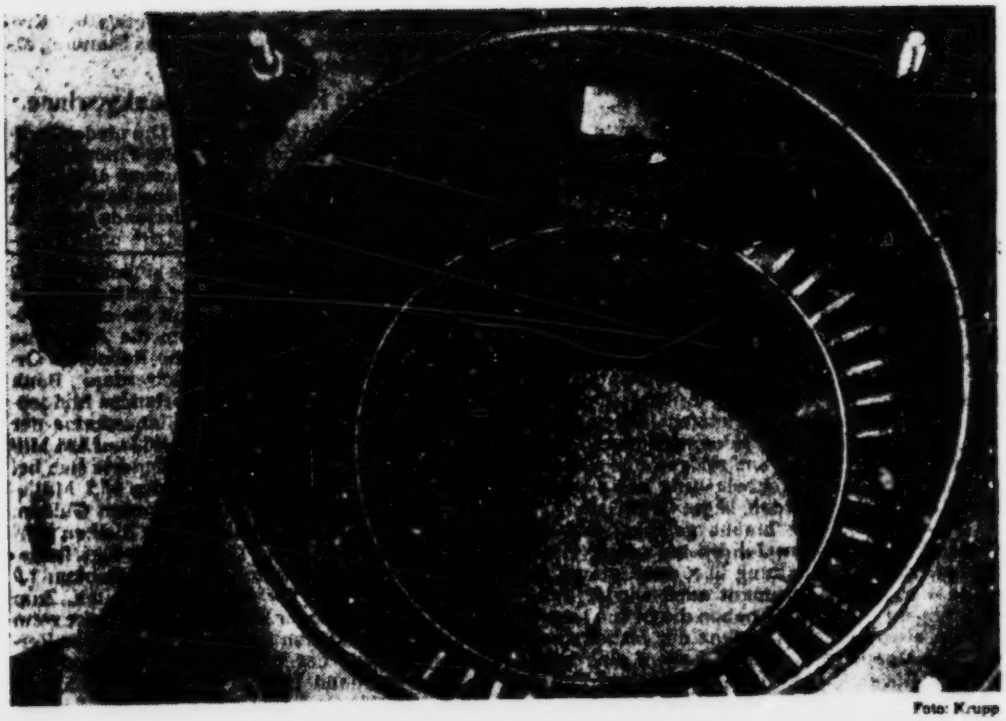


Foto: Krupp

5058
CSO: 3102/443

'PRODUCTICS' PLAN AIMS AT NATIONAL-SCALE AUTOMATION

Paris ELECTRONIQUE ACTUALITES in French 3 Sep 82 pp 1,4

[Article by G. Bidal: "With the 'Productics Plan,' National-Scale Automation Is at Stake"]

> [Text] To develop research, to improve transfers of technology with the industry, to create in enterprises the technical and human conditions that will lead to the acceptance and progress of automation: such are the ambitions of the future "productics" plan announced this summer by Mr Chevenement, minister of Research and Industry.

Few concrete decisions have yet been made for this program which aims at a 25 percent annual rate of growth in the process-control industry; no financial commitments have been made either, although investments are likely to exceed 2 billion francs over 3 years. In announcing this program, which is primarily intended to ensure consistency among the various sectors (electronic systems, machine-tools plan, textile, etc), the minister primarily intended to point out the decisive importance of process-control for the whole industry.

Just Another Plan?

Is the "productics program" outlined in July by Mr Chevenement just another "plan"? Probably not: in making this neologism official, the new minister of Research and Industry intended primarily to elevate to the rank of national priority the task of automating the French industry as a whole.

If he used "productics" rather than "robotics"--a word that the public mind probably still associates too much with job layoffs--it is also because the problem goes well beyond the limits of a given industrial sector or technology: rather, what is involved is the massively accelerated introduction of new technologies based on electronics in the whole French industrial fabric, and especially in the manufacturing sector.

To Act on Demand

As such, this plan--which must still be referred to in the future tense--will first concentrate on demand, its objective being to bring to 7 percent the

average production increase in manufacturing industries, which would mean doubling productivity within 10 years. At this rate, supply, and the process-control equipment industry as a whole, would sustain a rate of growth exceeding 25 percent per year. For the rest, the guidelines contain no surprise: developing research and procedures of transfer to the industry, with the creation of regional centers; making "technological audit" possibilities available to manufacturing industries in all regions; maintaining permanent contacts with all the personnel involved, essentially through unions; in brief, developing first and foremost a climate favorable to a modernization of industrial plants and equipment.

Obviously, these provisions are very broad; for more detail, we shall have to wait even though it is more than likely that the conclusions of the report of Mr Petiteau's Robotics Mission will be used as a framework. But the very intention of this new and ambitious plan obviously requires additional consideration; designed to link the "electronic systems action program" and other operations such as the machine-tools plan, it will have to reflect to a large extent the eight sectorial reports requested last April by the former minister of Industry and dealing with automation in the textile, clothing, shoe, wood-processing, furniture-making, plastics and ceramics industries. The productics plan will also have to rely on the conclusion of Mr Persuy's (Saunier-Duval) report on mechanical engineering: besides, the principal conclusions of this report have much to do with electronics since, according to Mr Persuy, the principal weakness of mechanical engineers, and one that must be corrected, is their lack of training in data-processing and electronics. A synthesis of these various reports is being prepared by Mr Tourret of the Economic Information and Forecasting Bureau. The difficulty in ensuring the consistency of a plan that involves many sectors probably explains why it is still incomplete, especially with respect to financial questions. All the more so as, to a large extent, the "productics" budget will be divided up among many other operations, electronic systems, machine-tools plan, etc.

Two Billion Francs Over Three Years

Nevertheless, this budget is expected to exceed 2 billion francs over 3 years, i.e. close to the amount recommended in the conclusions of the "Petiteau report."

Besides, the first decisions actually made come within the scope of electronics as they involve the creation of a national computer-assisted design and manufacture project, and the development of regional process-control research and development centers. A "software and engineering" section should also serve as a link between operations in the electronics sector and the operations contemplated in various other sectors.

9294
CSO: 3102/456

NEW SWEDISH STEEL PROCESS TO BE USED COMMERCIALLY IN CANADA

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
1 Sep 82 p 5

[Text] tar, Frankfurt, 31 August--The Inred method for pig iron production, developed in Sweden by Boliden AB, is to be used for the first time on a commercial basis by a steel mill belonging to the Canadian Ivaco, Inc., in the Province of Ontario, according to a report in the magazine INDUSTRIAL RESEARCH AND DEVELOPMENT. The contract, recently signed by both companies, represents extraordinary progress in pig iron production. Work on the project has already begun and is to be completed at the end of 1984 with the start of the first Inred steel mill. At a cost of about $100 million--of which $60 million alone are earmarked for the installation of the Inred system--Ivaco, one of North America's most successful steel producers, wants to expand and modernize its Ontario plant. Ivaco President Paul Invanier pointed to the many advantages of this method: Low degree of environmental pollution, low energy consumption, and the fact that only one reactor is needed. The Inred method is one of three modern pig iron production methods developed in Sweden in recent years. The other two are the plasma melt process of SKF Steel and the Eldred process of Asea/Stora Kopparberg. All three of them do not require any blast furnaces and reportedly show lower operating costs than the conventional pig iron production methods because sinter plants and coking plants can be eliminated. According to calculations and experiments, pig iron production based on the Inred method costs 30 percent less than the traditional way of using the blast furnace.

5058
CSO: 3102/443

RECOVERY OF HEAVY METALS FROM STEEL PLANT EXHAUST-GAS FILTERS

Stockholm NY TEKNIK in Swedish 10 Jun 82 pp 18-19

[Article by Sture Skold: "From Dangerous Waste to Valuable Metal. Profitable for SKF to Protect the Environment"]

[Text] Landskrona. The plasma technique is the solution to a serious environmental problem--the heavy metals from the exhaust gas filters in iron and steel mills. Worthless waste can also be converted to hard metals with this technique.

"This is a very profitable business," says Karl-David Sundberg, chief of SKF Steel. "It is so profitable that for the first time we are going into the recovery business. We have never done that before."

Together with Landskrona Finance, SKF has formed a new company, ScanDust AB, to start a recovery installation on Varvsudden in Landskrona. Each of the two companies are investing 20 million in capital and Landskrona Finance is also allowed to include an additional 3 million for the premises which are made available in the old Oresundsvarvet. An apparently good business since LF only paid 1 krona for the entire shipyard. The seller was the government-owned Svenska Varv.

Serious Problem

The Environmental Protection Agency also considers the project to be so important from an environmental point of view that they have gone in with a capital contribution of an additional 25 million kronor.

This money is a pure contribution and does not return a single krona regardless of how well the factory runs in the future.

"The ScanDust project solves one of the most serious problems in the steel industry," says Valfrid Paulson at the Environmental Protection Agency. The metal dust from the exhaust gas filters is now being placed in waste dumps, where the heavy metals can be leached out into the ground water. With the process installation in Landskrona it will instead become new metals.

According to the plans, the installation will produce 35,000 tons of metals annually when it starts operating in 1985. First of all, it will be metals

such as zinc and raw iron, but also chromium, nickel and molybdenum.

The raw material consists of 75,000 tons of metal dust from steel plants in Sweden and the rest of Scandinavia, but even dust from steel plants in central Europe may be of interest.

Commercial Breakthrough

"The establishment in Landskrona involves a commercial breakthrough for the plasma technology," says Karl-David Sundberg, "This is metallurgical processes from the 1980's and the 1990's, and we now expect to sell several installations in Europe."

Plasma dust is only one of several different processes involved in the plasma technique. The common denominator for these processes is the plasma generator. In this generator electrical energy is converted to heat energy, and this takes place through an ionized gas, a plasma.

"When the installation is ready, we will be able to run demonstrations of several of the other plasma processes."

Twenty-four Hours Every Day, All Year

The installation will be running 24 hours per day and for the whole year. Those who work there will be working in five shifts. In full operation the installation will employ approximately 70 men, 55 of which are collective employees who are taken from the laid-off shipyard personnel. In addition it is estimated that some 30 additional people from Landskrona will be employed in associated activities, guards, clean-up people, repairmen, etc.

In spite of the fact that the installation is considered to be economical with energy, large quantities of energy are required to extract pure metals from the metal dust from the exhaust gas filters. The installation will use approximately 90 GWh/h annually. This corresponds to 9,000 cubic meters of oil or one-half of the energy requirements in Landskrona today.

Develop Remote Heat

On the other hand the installation returns 45 GWh in the form of hot water. This will come in handy since the municipality is now developing the central remote heat network. The fact that the municipality recently decided to build a new hot water center for 10 million kronor means nothing, according to municipal counsel Bo Nilsson.

"We need all the energy we can get. There is room for the heat supply from ScanDust, too," says he.

The installation also gives approximately 30,000 tons in pure waste and slag products, and this will come in handy in the plans for building a proper deep port in Landskrona. It is believed that the waste can be used as an excellent fill material. A proper port is also a condition for being able to ship in all the metal-containing dust required for the process.

This Is How It Works

When the waste dust arrives at the process installation, it must be sorted according to whether it is low alloyed material (contains few alloys) or whether it is rich in alloys. Then the dust is mixed with coal, sand and water to form a slurry.

The slurry is pressed into filter cakes and dried by means of the surplus heat from the process. The cakes are then crushed again and stored in a silo.

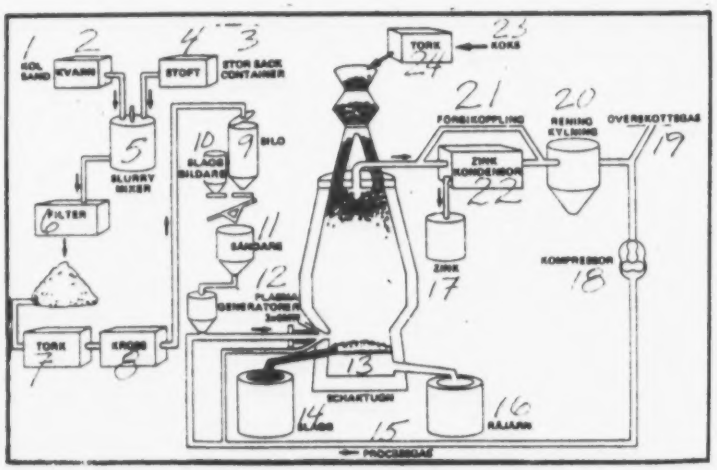
In the plasma generator itself, the processed gas consisting of 70 percent carbon monoxide and 30 percent hydrogen is ionized. This means that the electrons are separated from the gas atoms at a very high temperature, 3000--5000°C.

The hot plasma is then directed on to the reaction zone in a shaft furnace. When the powder from the silo is fed into the zone, the coal combines with the acid, and the metal oxides are decomposed into metals and carbon monoxide.

The iron is collected at the bottom of the shaft furnace, and if the powder from the silo contains zinc, it is converted into gas, which disappears up the shaft, where it is captured by a zinc condenser and precipitates in the form of molten zinc.

The carbon monoxide which is formed is used to dry the filter masses, keep the plasma dust process going and heat hot water, which later on can go out in a remote heat network. The slag product which remains is placed in an industrial stockpile or is used as building material.

"Of course, here in Landskrona it fits in extremely well," says Erik Cavalli-Bjorkman. "Large quantities of fill material are required for the planned deep port."



The heart of the process is a shaft furnace, in which the metal oxides are broken down into metals and carbon monoxide.

Key to the Figure:

1. Coal, sand
2. Grinder
3. Big sack container
4. Dust
5. Slurry mixer
6. Filter
7. Dryer
8. Crusher
9. Silo
10. Slag former
11. Transmitter
12. Plasma generators 3x6 MW
13. Shaft furnace
14. Slag
15. Process gas
16. Raw iron
17. Zinc
18. Compressor
19. Surplus gas
20. Cleaning, cooling
21. Bypass
22. Zinc condenser
23. Coke
24. Drying

8958
CSO: 3102/420

HISTORY OF AIRBUS, BOEING COMPETITION ANALYZED

Paris SCIENCES ET AVENIR in French Sep 82 pp 22-26

[Article by Jacques Morisset: "The Airbus-Boeing War. When Twin-Jets Challenge Long-Haul Aircraft"]

> [Text] The competition between the Boeing 767 and the Airbus A 310 on the medium-haul aircraft market is becoming fiercer all the time and, as a result, both aircraft have just shattered performance records for this category: the A 310 by connecting Kuwait to Singapore nonstop, the B 767 by doing the same for Oslo and Seattle. But economic and geopolitical considerations rather than technical characteristics will decide the issue of this ruthless war.

What is the true definition of a medium-haul aircraft? Until last 4 July, the answer was clear: an aircraft which can carry its passengers over distances ranging from 1,500 to 4,000-5,000 km: below that was the range of the short-haul aircraft; beyond, the realm of the long-haul aircraft dominated by the 150-380 ton 3-jet or 4-jet aircraft which can cross the oceans with all the safety margins required; the failure of one engine (even of two on certain aircraft) must not jeopardize in any way its precious cargo (150-500 passengers). On arrival, the aircraft must still contain enough fuel for diversion to another airport 200 nautical miles (370 km) from its destination point and for a 30-minute low-altitude holding flight in case of crowding of the terminal zone, poor visibility, etc. Therefore, everything has been designed so the long-haul aircraft never runs short of fuel, which would of course have tragic consequences. And, of course, twin-jets are forbidden to fly over the oceans, unless they remain at all times less than 90 minutes away from an airport: time enough to make a safe landing after a prolonged descent should an engine fail and the aircraft lose 50 percent of its thrust.

Let us point out that, whereas crossing the North Atlantic Ocean between Europe and the United States or Canada represents a 6,000-6,500 km flight (i.e. 7-8 hours in flight), most modern long-haul aircraft can do much better than that; this is why there are direct flights between Paris, London or Francfort and Los Angeles (10,000 km); there are even a few 11,000-km-long transpacific flights for which 3-jet DC 10's or 4-jet B 747 are used, which thus fly close to 13 hours without refueling and well deserve their name of "very long-haul aircraft."

On these flights, the crew is doubled and the most fortunate passengers, those in first class, are given fold-back seats which enable them to take some rest between their three meals and the inevitable movie.

Within a few days, all this was now thrown back into question by the remarkable performances of two ambitious newcomers among transport aircraft: the Airbus A 310 on the one hand, the Boeing 767 on the other hand, which have literally shattered the sacrosanct limitations of medium-haul jet aircraft; the A 310 in the night of 3-4 July by linking Kuwait to Singapore, which represents a flight distance of slightly over 4,000 nautical miles (7,410 km); the Boeing 767 in the night of 6-7 July by linking Boston to Turin, thus covering about 3,780 nautical miles (7,000 km), followed by a direct Oslo-Seattle flight, i.e. 8,030 km, on 21 July!

The history of these extraordinary flights deserves recounting in detail as the circumstances under which they took place also illustrate the fierce struggle which now opposes Boeing to Airbus Industrie: the old and the new, in a way.

Before that, we must take a look back; in July 1978, Airbus Industrie and Boeing announced almost simultaneously the start of two large projects very closely related, and therefore in direct competition: the Airbus A 310 on the one hand, the B 767 on the other hand. The A 310 was introduced as an aircraft complementing the A 300 (already in service for 4 years) and with a smaller capacity: 200 seats instead of 250. The fuselage diameter was the same as on the A 300 so as to maintain a certain relationship with the latter, and the new aircraft was therefore shorter. The wings, however, were entirely redesigned so as to take full advantage of the latest progress in aerodynamics (especially through the use of so-called "supercritical" airfoils which, for equal velocities, make it possible to have thicker, i.e. more rigid and, therefore, lighter wings, as well as a large useful volume to house fuel tanks); they were also smaller (210 square meters instead of 300), therefore lighter and well adapted to the mass of the new aircraft which was to weigh 15 tons less than the A 300. Finally, all the avionics (electronic systems) were redesigned and relied in particular on digital data transmission, instead of the analog systems used until then. Indeed, digitalization makes it possible to decrease weight and increase precision and safety. Practically, Airbus Industrie had thus designed an 80 percent new aircraft, more modern and more economical to use and, for its part, the A 300 benefited from the progress realized on the A 310, and a new 270-seat version, the future A 300-600 (to fly next year) was introduced. At any rate, the intention had been to create a medium-haul aircraft that could be used for 500-5,000 km flights.

The problem was slightly different at Boeing which created an entirely new aircraft that was to place itself halfway between the 3-jet B 727 (150 seats) and the huge B 747 (350-500 seats). However, Boeing also has in mind a three-jet long-haul, and therefore heavier, version of the B 767: the future B 777. As a result, a 283-square-meter wing area was selected, as it would eventually be most suitable for the B 777, although it had the disavantage of uselessly weighing down the B 767 with a wing that was slightly too large for it. For the rest (engines, transport capacity, range, takeoff and landing performances), the B 767 appeared as a true replica of the A 310.

Years went by; while orders were piling up, mainly for the A 310 in Europe and the Middle East, and for the B 767 in North America, although at a lesser rate than had been expected (due to the stagnation of world air transport and the resulting financial difficulties for most airlines), the two manufacturers made a point of adhering strictly to the development schedules published in July 1978. On 26 September 1981, the first B 767 made its initial flight in Seattle; it was followed by 5 more aircraft, which already totalled 1,900 flight hours at the end of July, when the FAA gave the new aircraft its certificate of airworthiness. In August, deliveries to United Airlines started and the aircraft will be placed into service on 8 September. Boeing is scheduled to deliver 26 B 767's before the end of year, the initial production rate being 4.5 aircraft per month. Let us point out in passing that this rate is also that of the Airbus A 300 which has been on the line for 8 years now. This is a measure of Boeing's quickness in delivering a new aircraft: the line starts immediately at a high rate in order to meet consumer requirements as soon as possible and saturate the market to the greatest possible extent: later on, the production rate can always be adjusted to the demand and manufacturing personnel laid off at short notice, a sine qua non of efficiency from the American point of view...

As for Airbus Industrie, the first A 310 flew on 3 April, and testing started on the second on 13 May and on the third in August. Certification is scheduled for late March 1982 [as published], and the first deliveries to Swissair and Lufthansa immediately afterward. Therefore, there is an 8 months' lag between the two programs, which can be accounted for by the very nature of Airbus Industrie: a consortium of six manufacturers from six countries (Germany, Belgium, Spain, France, Great-Britain and the Netherlands). Managing such a group will of course result in a few problems, with respect to both coordination and decision-making, not to mention, as a backdrop, the control that must be exerted by the governments who have provided their financial guarantee. That is the other side of the coin; on the other hand, government support provides the group with a stability envied by Boeing which must rely exclusively on the market and the banks...

As for the rise in production rate, it is expected to be much slower than that of the B 767 with, however, an essential correction: in Toulouse, the A 310 is progressively taking its place on the well-organized assembly line of the A 300. Properly speaking, therefore, no new assembly line is being started but an existing line is being modified, the A 300 being progressively phased out and replaced by the A 310 and the A 300-600. And Airbus project managers intend to keep to a very progressive production rate rise: 4 aircraft per month earlier this year, 4.5 now, 5-6 in 1983, 7 in 1984. Later on, the rate could be increased to 8 or even 10 if necessary. Such a method, while not easily adaptable to demand variations, has however the advantage of making the best possible use of the plants and equipment, which makes operation more economical and avoids sudden hirings and firings which are very unpopular this side of the Atlantic.

Let us now consider what happened in July. After proclaiming everywhere that the B 767 was better than the A 310 in every respect, Boeing had intended to strike a decisive blow by having the seventh B 767 cross the North Atlantic

with a few journalists on board, as part of the endurance flight program on airways required prior to certification. Of course, as we said above, such a crossing would not be permitted as a commercial flight: as an experiment, it was.

On 6 July at 20:15, the seventh B 767, already carrying United Airlines' colors, left the Boston airport (northeast of New York); 81 passengers were on board and the tanks were full, i.e. the aircraft was carrying 51.6 tons of fuel. Considering the freight in its hold, the B 767 was even overloaded since it weighed 147.85 tons, i.e. close to 12 tons over the weight at which it was scheduled to be certified (136 tons). There again, such an overload would not be permitted on a regular flight: we should point out, however, that by 1983, with somewhat higher-thrust engines, the B 767 will see its maximum takeoff weight increased to 143 tons, and to 152 tons by 1984. Therefore, as a demonstration, the decision to have the aircraft take off with a weight of 147.85 tons was not unusual... but the takeoff took a long time.

Eight hours and 11 minutes later, i.e. in the morning of 7 July, the aircraft landed in Turin; as the crow flies, it had covered close to 6,000 km, with a slight tail wind it must be said; but, prior to that, the aircraft had flown over the London area before finally heading for Turin: therefore, the "flight" distance to consider was, according to Boeing, close to 7,000 km. On landing, there were still 11.4 tons of fuel in the tanks; the aircraft had consumed 40.2 tons of kerosene, i.e. 5.74 kg/km "flown." The "equivalent" payload (81 passengers plus freight plus excess fuel) was somewhat over 20 tons. Therefore, the B 767 could easily have carried 200 passengers and their luggage on that same flight, and even gone appreciably further.

On the European side, in the afternoon of 3 July, i.e. 3 days earlier, the second A 310, which had flown only 23 times since its initial flight, was at the Kuwait airport. The heat was stifling: 42°C in the shade, which lowered both the engine thrust and the wing lift (the air being less dense). At the controls was Bernard Ziegler, Airbus Industrie test flight manager, who had secretly prepared a "very long" flight, much longer than that announced by Boeing. The aircraft had of course full fuel tanks (43 tons of fuel) and took over at its maximum "normal" weight of 138.6 tons; the sizeable testing equipment was still on board and, together with various equipment and spare parts, represented a load of 18.6 tons (i.e. very precisely 200 passengers at 90 kg each, luggage included).

At 3:30 am (4 July) after an 8 hour 40 minute flight, the second A 310 landed in Singapore; it had covered 6,780 km but, in view of the strong head wind which had prevailed (over 80 km/h), the equivalent "flown" distance was 7,410 km. On approaching, the aircraft still had 4.2 tons of fuel in its tanks, enough to fly another 70 minutes and be diverted to Jakarta. Total consumption was 38.9 tons, i.e. 5.25 kg/km. Even taking into account the difference in weight between the two aircraft (the B 767 being 6.7 percent heavier), the new Airbus had shown that its specific fuel consumption was slightly lower than that of the B 767, not 10 percent higher as Boeing liked to "demonstrate" based on a graph.

Presumably piqued by the feat of the A 310, the B 767 team did not wait long to react; following its tour of Europe and the Middle East, the seventh B 767, leaving Oslo on 21 July, was scheduled to fly to Seattle via Frobisher (Baffin Island): but that is not what it did. Ignoring the scheduled stop, it flew nonstop from Oslo to Seattle, thus covering 8,030 km in 9 hours 50 minutes, after taking off with a weight of 143.8 tons, including a 13.8-ton payload. For a "medium-haul" twin jet, this is certainly a remarkable performance. But, there again, the fuel consumption was 5.7 kg/km, higher than that of the A 310.

Spectacular as these long-range flights may be, they should not make us forget that present regulations, especially U.S. regulations (which are more severe than the international ICAO [International Civil Aviation Organization] regulations), will hardly allow either the A 310 or the B 767 to be used for everyday commercial flights across the North Atlantic. But some pressure is already being exerted on the Federal Aviation Agency to induce it to amend its regulations. In the medium range, therefore, these two aircraft could be used to connect European capitals and the large cities on the east coast of North America, although passengers' attitudes could act as a psychological brake: they should not be blamed if they prefer crossing the Atlantic on board a three-jet or four-jet aircraft, even though the 90-minute rule guarantees them "reasonable" safety should one of the engines fail...

The airlines too will probably hesitate. But what will happen when one or two airlines, attracted by the high efficiency of the two new aircraft, decide to use them on North Atlantic airways? Sooner or later, the others will have to follow suit if they are not to lose some of their customers. The example of Laker is there to show that low-cost tickets are terribly attractive. And it is easier to fill a 200-250 seater than a B 747 (400 to 500 seats).

In the short range, however, the competition between Boeing and Airbus Industrie will be restricted to short and medium-haul networks. In principle, Boeing has the advantage with 173 firm orders plus 118 options for its B 767--i.e. a total of 291 units--from 17 companies. But Boeing has not sold a single B 767 during the past year,* and 221 of these aircraft (i.e. 76 percent) were sold on the privileged market represented by North America, not to mention the Damocles sword represented by requests from several North American companies, most of them operating in the red, to cancel orders or postpone deliveries, and banks' strong hesitations in granting all the credits required to purchase new aircraft, even more efficient ones.

The position of Airbus Industrie appears much better. Only 192 A 310's have been sold, but also to 17 companies better distributed geographically. In addition, the A 300 is still being sold (323 units, including 185 already delivered). The total number of aircraft to be delivered (330) is therefore higher than for the Boeing. And, with 103 orders in 24 months, compared with 21 order for the Boeing, the European consortium is sailing with the wind; it has even managed to outclass Boeing 98 percent on the Middle East and Far East market, the most active at present.

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* At least early in August, when this article was written.

The excellent reputation of the A 300 has done a lot to facilitate the introduction of the A 310, the performances of which appear to be slightly better than those of the B 767 on short and medium flights. On truly long flights, the two aircraft can be expected to be even: but, as we have seen, the market is not yet ready for this type of operation. Except in one area: the Middle East where flights over the sea are the shortest; and it is precisely in this area that the A 300 and A 310 have scored the most points.

Of course, with 200 customers instead of 46, its remarkable power of adaptation and its very complete line--B 747, B 757 and B 767 twin jets, B 727 three-jet and B 747 four-jet aircraft--Boeing still has pride of place. But, confronted with a market in full recession, its production rates are declining dramatically. It will take many years to repay the huge investments required by the almost simultaneous introduction of the B 757 and B 767, i.e. over 3 billion dollars (close to 19 billion francs!). The same is true, of course, of Airbus Industrie: but, in such a situation, it is better to be supported by governments who care about employment than by a banking apparatus, however powerful, which is more concerned about short and medium-range profitability.

Technically, both manufacturers--it is now obvious--are equal; they use the same technologies and the same engines (Pratt and Whitney and General Electric); as far as financing conditions are concerned (length and interest rates on 8-10 year loans to purchasers), competition remains severe but appears to be even; geopolitically, some market areas are still halfway off-limits, but they have become smaller: the United States for Boeing, Europe for Airbus Industrie (and yet...).

There remains the "line effect"; far ahead of Douglas (DC 9 and DC 10), Boeing remains the only manufacturer with a complete line of transport aircraft, which is an undeniable advantage when dealing with airlines, especially small and medium-size ones. The Seattle manufacturer is understandably worried (which explains its calls for help from the U.S. government) by the almost certain introduction of a 150-seat twin-jet, the A 320, by Airbus Industrie. The European consortium has already obtained the agreement in principle of its 6 present partners and has just obtained Canada's (De Havilland Aircraft) for up to 500 million dollars, in exchange for a 10 percent guaranteed participation in the A 320 design and manufacturing program. When the latter is actually started, i.e. in the coming months, the war between Boeing and Airbus Industrie will extend to a much larger front. At the very moment when M.T.A. Wilson, chairman of Boeing, does not hesitate to state: "If I had known that the market would become what it has become, we would never have taken the risk of introducing two programs as large as the B 767 and the B 757 at a few months' interval." Faced with the A 320, will he be in a position to introduce the B 777?

9299
CSO: 3102/448

MAGNET-DRIVEN TRAINS DEVELOPED FOR BERLIN

Test Runs in 1984

Duesseldorf VDI NACHRICHTEN in German 9 Jul 82 p 1

[Article by R.R.R.: "The Magnetic Train Will Roll in Berlin in 1984"]

[Text] The first "M-train" is scheduled to make its first test run in Berlin's Kreuzberg district in 1984. The FRG Ministry for Research and Technology has agreed to pay for 75 percent of the overall cost. They will amount to DM 50 million in two parts: the first includes retrofitting of a section of subway tracks no longer in use to accept the new system; the second part will include tests for roadworthiness, structural effects and acceptance by the public.

Even though the advantages of compartmentalized trains consist mainly in connecting peripheral parts of the city with existing traffic hubs, optimists can already visualize M-trains rolling on currently inactive S-train lines and even on the existing U-train lines. They maintain that all that is necessary would be to superimpose the special M-train rail on the existing rails and to move the line motor. Thus reactor to the project ranges all the way from euphoric visions of the future to contemptuous rejection. The CDU Senat and fraction maintain that Berlin could continue its great tradition and functions in the transport sector. The M-train, they say, could be exported from here to the rest of the world. The SPD on the other hand, during whose reign the project was actually initiated, took a more distant view: the Senat, they say, should first propose a financially feasible concept for the obsolete S-train. In addition, the SPD spokesman drew a parallel between the "M" and Maerklin, the model railroad manufacturer, thus clearly expressing his fraction's attitude toward the magnet-driven train project.

Unconventional Technology

Duesseldorf VDI NACHRICHTEN in German 9 Jul 82 p 26

[Article by R.R.R.: "The M-Train Has Already Logged 200,000 Km of Test Runs"]

[Text] The M-train, which is to run on a 600 meter stretch in West Berlin's Kreuzberg district in 1984, is one of the compartmentalized trains with automated controls, just like the H-train in Dortmund which has also been fabricated for the first time for public use. Advantages are seen in comparison with buses or conventional rail vehicles especially because of the reduced need for operating personnel because of its driverless operation, the more flexible computerized guidance system, as well as economy in the use of energy.

M-train cars are guided and supported on their track by rollers, with repelling permanent magnets providing a considerable reduction in the weight affecting the carrying rollers. In the roadbed there is the triple-phase winding of a fixed linear motor, whose broad frequency field moves the train. They can therefore be manufactured simply, easily and relatively cheaply. The roadbed investment too is said to be only half as expensive as that of U- and S-trains.

However, just the retrofitting of the existing U-train system, unused since the 1961 partition, extending from the Gleisdreieck rail station in the direction of Potsdamer Platz, is estimated at DM 20 million, even though the M-train will travel only as far as the Schoeneberg shore, a distance of 600 meters. For the time being, the intention is to test the new technology there, which has already logged 200,000 km in test runs at a test facility of the TU Braunschweig. Upon official certification, the train will be turned over for public use. This will require further costs, budgeted at DM 30 million, for structural compatibility, roadworthiness and public acceptance. A later phase would propose extending the line to Kemperplatz.

AEG-Telefunken has participated to a considerable degree in the M-train system project since 1978. The firm wants to build components and cars in Berlin and thus hopes to create 300 new jobs.

9273
CSO: 3698/1

DFVLR DESIGNS AIRCRAFT TO DEVELOP, TEST NEW TECHNOLOGIES

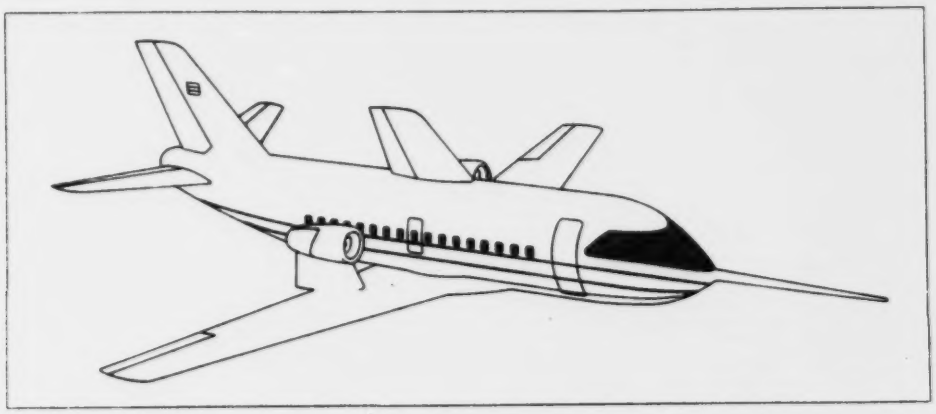
Cologne DFVLR NACHRICHTEN in German Jun 82 p 38

[Article: "New DFVLR Research Aircraft Under Development"]

[Text] Even the most modern transport aircraft can still reduce their fuel consumption, for instance through optimum flight procedures in direct landing without going around which, together with extensive stacking in the immediate airport vicinity can account for up to 25 percent of the total fuel consumption. The DFVLR [German Research and Development Institute for Air and Space Travel] in Braunschweig will therefore intensify its research programs for development and testing of new flight procedure technologies. An important prerequisite therefore is the retrofitting of a research aircraft which will be used as a "flying simulator." Bremen's Vereinigte Flugtechnische Werke [United Aviation Technologies] are therefore re-equipping a VFW 614 aircraft (illustration) for research purposes. This flying laboratory is intended for development and testing of new flight procedure technologies. The emphasis in this will be new navigation methods, the use of microelectronics, improved information and graphic presentation systems for pilot use, as well as improved communication with ground controllers and other aircraft.

Currently the most acute problems in air traffic are high traffic density, environmental disturbance by noise and air pollution, and steadily increasing costs of personnel and raw materials. Research with the use of the new flying laboratory is intended to provide solutions to some of these problems by developing means for reducing minimum distances between aircraft and closer landing sequences as well as to establish flight patterns which would save on fuel and reduce noise pollution to the lowest possible level. The flying laboratory will be used mainly within the immediate airport area, in final approaches as well as in takeoffs and landings. Such use will be pertinent to investigation of flight characteristics of civilian transport aircraft, whereby the flying laboratory will be used as an in-flight simulator. In addition, the research aircraft will be used for testing digitally integrated flight guidance systems (e.g., Autoland) as well as for automated air traffic control and new landing systems. One of the prerequisites for employing the DFVLR research aircraft in these tasks is the capability of flying the aircraft "electrically. Only the backup pilot would use the normal mechanical control

system in special cases; the test pilot however gives his commands by way of an on-board computer to an automated control system. This makes it possible to combine the pilot's commands with the pre-programmed test program in the computer. In this way it is possible to change the overall aerodynamics of the aircraft in such a way that it can assume the characteristics of, say, an Airbus. Inasmuch as the flying laboratory can in addition be equipped with an interchangeable instrument panel at the test pilot's seat, pilots can test the airworthiness of new aircraft and their electronics long before the first prototype is rolled out. The aircraft being retrofitted by VFW is to be ready by late 1984. Thereafter, the DFVLR will equip it with its data processing system and the test program will follow. It is estimated that the flying test laboratory will be available for customer contracting in late 1986.



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The new DFVLR research aircraft; other possibilities include an additional stabilizer fin, as shown in the sketch.

9273
CSO: 3698/1

FUTURE OF ROLLS-ROYCE RJ500 STILL NOT CLEAR

Paris AVIATION MAGAZINE INTERNATIONAL in French 1 Sep 82 pp 34-35

[Article: "Rolls-Royce: Rationalization First"]

[Excerpt] That Famous "10-Tons"

The British engine manufacturer is now concentrating its efforts on improving projects with a large technological and commercial potential, on the one hand, and on the study of entirely new realizations, on the other hand. The new 524 and 535E4 versions of the RB-211, the Pegasus F402-RR-406 intended for the AV-8B Harrier II,* the Spey 807 to propel the Italian-Brazilian AMX support aircraft, or again the thrust increase on the Adour and Viper, the improvement of the specific consumption of the famous Dart, the development of the Gem, etc., obviously fall into the first category.

The principal new projects are essentially the RJ500, an English-Japanese 10-ton civilian aircraft, the RB 401 in the 2,500 kgp class, intended both for the corporate aircraft and the light military aircraft markets, and, finally, the RB510, a new generation 2,500-3,500 hp turboprop which, in the long range, could see its power increased to, or beyond 5,000 hp.

To a large extent, the RJ500 gets star billing; two demonstration engines are operating on the bench, one in Derby, the other in Tokyo. Obviously, the 10-ton and 150-seat aircraft will still be much talked about: aircraft and engine manufacturers everywhere agree more strongly than ever that there is a large potential market for these aircraft, that it is just a matter of waiting long enough, that the recession justifies postponing a real start to the end of the decade.

The RJ500, which is in the 9,000-12,250 kgp range, pending precise requirements from aircraft manufacturers, associates the Derby manufacturer with a Japanese consortium consisting of Ishikawajima-Harima, Kawasaki and Mitsubishi. The

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* Engine names on both sides of the Atlantic are often a headache and a source of confusion. Rolls-Royce habits in this respect are no exception to the rule...

industrial implementation of such a project will require colossal investments (probably at least 750 million pounds) and explains why fierce competitors no longer hesitate to find an area of agreement.

A few months ago, Rolls-Royce and Pratt & Whitney agreed on the advantage of a tentative agreement. Negotiations are now in progress, very discreetly, in the hope of allying the RJ500 and the STF-632, with MTU [expansion unknown] and Fiat following not far behind. A total of seven engine manufacturers, therefore, including two of the three world giants, since General Electric will stick to its French connection, i.e. its agreements with SNECMA [National Aircraft Engine Study and Manufacturing Company]. There again, they will meet in Farnborough to see if negotiations have serious chances of succeeding. And to see what is in store for the Airbus A-320, McDonnel-Douglas D-3300 and other Boeing 7-7 projects.

9294
CSO: 3102/457

BRIEFS

ATR42 ORDERS--Air Caledonie, headquartered in Noumea, just ordered two French-Italian ATR42 commuter aircraft, thus bringing to 34 the total number of orders for this aircraft. In a communique, the National Industrial Aerospace Company (Aerospatiale), which formed an economic interest group with Aeritalia in order to develop this new aircraft, indicated that Air Caledonie had also taken an option for two more aircraft. The ATR42, scheduled to be delivered in May and October 1986, will be used on the domestic and regional Pacific networks of Air Caledonie. The airline chose the ATR-200 46-48 passenger version; it is the seventh airline in the world and the first in Oceania to select the ATR42. According to Aerospatiale, world airline requirements for commuter aircraft will amount to 2,000 units over the next 15 years. [Text] [Paris LES ECHOS in French 3 Sep 82 p 8] 9294

CSO: 3102/457

END

JPRS 82077

26 October 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 124

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SCIENCE AND TECHNOLOGY

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Paris ZERO UN INFORMATIQUE HEBDO in French 20 Sep 82 p 87

[Article by Gerard Schmitt: "Four Poles for PAFE"]

[Text] In presenting his ministry's 1983 draft budget on Wednesday, and in his address the next day at the Forum of Expansion, Jean-Pierre Chevenement finally disclosed some details on PAFE [Government Program for Development of Electronics], leaving it to Jacques Stern, president of CII-HB [International Data Processing Company-Honeywell Bull], to present, on 20 September, the company's new strategy, and and carefully avoiding marring the freshness of the topic of the talk Jean-Claude Hirel, director of the DIELI [Directorate of the Electronics Industries and Data Processing], would be giving on the same day at the opening of the Data Processing Convention.

Addressing "DIELI Electronics" on Thursday morning, therefore, and France's outlook in this domain, the minister of research and industry presented the broad outlines of the PAFE's industrial aspects. "The new industrial strategy will proceed on three fronts (...). The first will be that of the attack (...) we will bring to bear in three domains: Components, data processing and electronic products for the general market."

In the components field, action will be centered initially on a research effort.

As regards MOS [metal oxide semiconductor] circuits, the aim is to bring the coverage of the French market demand up from its present 16 percent to 100 percent by 1986, three-quarters of it to be supplied by French enterprises.

In bipolar components, the aim is that French industry become the European leader with 45 percent of the market and 13 percent of the world market, versus 20 percent and 5 percent respectively today.

Essentially, three French enterprises are involved in this activity: Thomson, MATRA [Mechanics, Aviation and Traction Company] and Saint-Gobain. "There is in this," the minister said, "a danger of dispersion of effort, and a scheme now nearing completion should facilitate the reorganization of this sector around just two nerve centers."

Ministry of Research and Industry's Draft Budget for 1983

Item	Industry	Research	Total	Percent Increase 1983/1982
Regular (operating) expenses [OE]:				
--Ministry (operation of services)	951.5	118.2	1,069.7	+11.1
--Operating subsidies to research organizations	15.1	13,224.6	13,239.7	+18.8
--Grants to industry	7,645.0	217.1	7,862.1	+27.1
Total operating expenses	8,611.6	13,559.9	22,171.5	+21.2
Program authorizations (capital expenditures) [PA]:				
--Research organizational grants and investments	21.7	8,801.1	8,822.8	+14.0
--Industrial investments	4,039.2	1,165.8	5,205.0	+17.6
Total program authorizations	4,060.9	9,966.9	14,027.8	+15.4
Total OE + PA	12,672.5	23,526.8	36,199.3	+18.9

Eurotechnique would sustain the costs of this restructuring (several possible plans are still under study with Thomson-EFCIS [Research and Manufacture of Integrated Circuits] and CII-HB).

In data processing, efforts will be regrouped around CII-HB. The strategy of the national builder will henceforth be "more enlightened, more aggre ive and self-assertive," and will proceed along four principal axes, the details of which appear to indicate that CII-HB still has every intention of making its presence felt in all the niches of this market.

Confirming the imminent putting in place of the national "chips for mini- and microprocessors" project, Jean-Pierre Chevenement made a brief reference (intentionally?) to "the takeover of the SEMS [expansion unknown] by the CMB [Bull Machines Company] (parent company of CII-HB)."

As for general electronics products, the leadership will be provided by Thomson.

The second front, that of coherence technologies, will be aimed at maintaining our "strong positions," which are telecommunications and professional-market electronics, and at developing electronic instrumentation for medical and space uses. Particularly "in the domain of production engineering (...), a regrouping of forces around the CGE [General Electrical Company] and MATRA, through their different subsidiaries, will be sought".

However, "It is out of the question to imagine that France, through her own efforts alone, can profoundly change the existing balance in the electronics sector." She will also seek to implement a policy of international cooperation. This will be her third strategic front.

"We will commit the funds needed to ensure the success of this strategy, and, beginning this year, the 1983 budget will show a doubling of the credits allocated to the electronics effort." In fact, the appropriations being requested reflect an increase of 111.4 percent from 640 million francs in 1982 to 1,352.8 million francs in 1983. To these credits must be added those of the oversight agencies such as the ADI [Data Processing Agency] and the CESIA [expansion unknown], whose investment outlays will increase from 229.8 million francs (1982) to 268.3 million francs (1983) and from 17.2 million francs (1982) to 21.7 million francs (1983), respectively.

Lastly, the public-sector enterprises will receive, in 1983, government subsidies in the form of capital grants totaling 7,300 million francs, 500 million of which are already reserved for CII-HB.

More Information From Hirel

Paris LES ECHOS in French 21 Sep 82 p 3

[Text] In his address, to a packed auditorium, at the opening of the Data Processing Convention, Jean-Claude Hirel provided more details on the content

of the PAFE [Government Program for Development of Electronics], the industrial aspects of which had already been outlined last week by Jean-Pierre Chevenement. Coupled to the planned investments totaling 140 billion francs over a period of 5 years, the quite specific production objectives have now been set forth.

Overall, the annual growth of the sector is to be increased from 3.1 to 9 percent, attaining 170 billion constant francs in 5 years instead of the 130 billion that had been forecast by merely following the trend. For components, the objective is a production of 2.1 billion francs, with an overall rate of demand coverage of 100 percent.

In passing, the director of the DIELI remarked that "There can be no industrial policy without a utilization policy; in particular, the coordination of a policy of procurement of components, especially by large industrial groups, must be an ongoing effort."

In the general electronics sector, in which Thomson's lead role was confirmed, the aim is to attain a production level of 10 billion francs in 5 years, corresponding to 70 percent of the French market as compared to 50 percent today. A very clear allusion was made to some imminent alliances: "It is desirable to undertake some developments by way of external growth. Talks are under way. They could come to fruition before the end of this year."

In the data processing domain, the aim is 35 billion francs, or 100 percent of the French market. This was set forth with the following comment: "CII-HB has always been thought of as the national champion of the French data processing scene. Now, it must actually become so."

Within the terms of reference of the cession of the SEMS, Th[illegible] will be associated with CII-HB for the development of the big military computer. Jean-Pierre Chevenement. And Jean-Pierre Chevenement will shortly receive the visit of the general manager of Olivetti "to talk about the future of relations between that group and France."

Funding priorities (state, industries, public and private investors) were also discussed by Jean-Claude Hirel: 40 percent will go to consolidating the strongpoints, which are electronics for the professional market and telecommunications, 43 percent to components, general electronics products and data processing.

To steer this policy, a coordination committee has been set up under the Interministerial Committee for Electronics, consisting of four heads of administration from the Ministries of Industry, PTT, Defense and the Plan, and others "should they be needed." Budget appropriations will exceed 2 billion francs in 1983 and will come to as much as 8 billion francs if one adds in the credits "thrown in" by Defense and PTT.

9238
CSO: 3698/3

ELECTRONICS FIELD IS 1983 PRIORITY FOR ANVAR

Paris ELECTRONIQUE ACTUALITES in French 17 Sep 82 p 2

[Text] On 9 September, ANVAR [National Agency for the Valorization of Research] unveiled its program in support of the government's industrial and research policy. This program features a sharp increase in the innovation bonus from 20 million francs in 1981 to 30-40 million francs in 1982, and almost triple this figure in 1983. Furthermore, the electronics and energy sectors will be priority ones and will benefit from higher margins of coverage than the average (35 percent).

Mr Marbach, ANVAR's general manager, has submitted projects for 1983 that are supportive of the governmental programs designed to motivate innovation. It is worthy of note that the governmental appropriation under the 1983 budget will be almost triple that of the previous year, and that furthermore the margin of coverage to be guaranteed by ANVAR for privileged programs, which include the electronics one, will increase from 25 percent to 35 percent. This increase is linked to a planned increase of 17.8 percent in the research budget.

The system of subsidies and bonuses for innovation has been highly successful: In 1981, 1,400 dossiers benefited from favorable decisions; for the first half of 1982, this figure was 780 dossiers, indicating that there will be some 1,700 such dossiers for all of 1982.

Place of the Motivative Programs

Similarly, since 1979, ANVAR has granted 1,743.6 million francs in subsidies to innovation; under the motivative programs decreed by the Ministry of Research and Industry, 857 million francs have been distributed among 500 dossiers, 302 of which concern energy and 197 electronics. In the electronics field, the portion that has gone to instrumentation has been preponderant, but the effort being deployed on components, professional equipment and even on general consumer electronics has also been supported. In all, 10 percent of the innovations supported by ANVAR pertain to the professional electronics sector and data processing.

The number of applications for subsidy filed as of 30 June 1982 for this year totaled 3,559, of which, for the sectors of interest herein, 6 were for research, 158 for data processing, 90 for electronics and 86 for automation. ANVAR finds no discouragement on the part of enterprises from the standpoint of innovation, but notes a very contrasty regional distribution pattern as well as a need for substantial funding in support of the applications being filed.

9238
CSO: 3698/7

CII-HB INTRODUCES HIGH-SPEED IMPACTLESS PRINTER

Paris ELECTRONIQUE ACTUALITES in French 17 Sep 82 p 9

[Article by J. P. Feste: "CII-HB: Impactless Printing at 6000 Lines Per Minute"]

[Text] CII-HB [International Data Processing Company--Honeywell Bull] has developed an impactless electromagnetic printing technique that is to be exhibited at the SICOB [Exposition of Office and Business Supply Industries and Business Organizations] in the form of a prototype printer.

This printing technique permits the printing of 6,000 lines per minute, or 88 lines per minute, with a resolution of 240 x 240 points per square inch. The MTBF [Mean Time Between Failures] of this printing head is put at 1 million pages, or around four times better than that of existing systems offering similar performance.

3,360 Magnetic Heads In Line

This printing technique makes use of magnetism; it consists of an in-line array of 3,360 magnetic heads that produce a magnetic latent image on a production platen. A magnetic powder is then spread over this platen and then cold-transferred by pressure onto the paper.

Each head consists of a high-magnetic-permeability, wound metallic core. One of the poles of the head has the shape of the point that will be used to composite the grapheme to be printed. The magnetic field formed by the head is closed by way of the printing platen. This platen, 10 cm in diameter, consists of a ferromagnetic core clad with a nonmagnetic covering and sheathed in the nickel-chrome reproduction outer covering.

So that only the printing pole of the head will leave significant residual magnetic information on the platen, the head has two poles of dissymetrical areas, ensuring that the flux through the printing pole will be greater than the flux through the field return pole. The magnetic field in the air gap of the printing pole will therefore be very great (inversely proportional to the area of the pole) with respect to the field in the air gap of the return pole.

The size of the point, 100 microns, is, with this configuration, exactly equal to that of the reproduction pole, and each head, to be active, needs only current pulses of around 10 milliamperes. The need of only a current pulse for purposes of command makes it feasible to use multiplexing to control the head array.

This array of 3,360 magnetic heads is divided into 10 multiplexed modules. The 3,360 heads are arranged in a horizontal line; the concentration of the printing poles is 240 per inch. The imaging sweep, by rotation of the platen, also defines an image concentration of 240 points per inch.

To command this large number of magnetic heads, CII-HB has devised a matrix configuration of the heads in each module of 336 heads each, such that 48 control lines and 70 command lines are sufficient.

The magnetic platen turns at constant speed and, at each rotation, passes in front of a head that demagnetizes it and prepares it for a new magnetic latent image.

On the platen, the latent image corresponds to one page. This image is in some way developed as it passes through an inking device using fine-grained, premagnetized magnetic particles. Excess particles on the platen are removed by a pneumatic device. Transfer of the image developed by the magnetic powder is effected by pressure on the paper, where it is fixed by heat-drying. A scraping device removes the excess ink after the printing, then the platen goes into its demagnetizing cycle.

The principle can even be used for two-color printing; it is only necessary to use a second magnetic powder of another color and premagnetized with opposite polarity. To print in this color, the heads must receive a current pulse of inverse polarity to that used for black and white printing, for example.

This technique also makes it possible to make as many duplicates of a page as desired: In this case, it is only necessary not to demagnetize the platen; the residual magnetization of the page will provide multiple printings.

When the Printer?

According to CII-HB, this impactless printing system should be more reliable than its competitors, owing to the very small number of moving parts. Furthermore, the fabrication of the heads, largely automated, should enable the company to market this type of printer right from the industrialization phase, at a lower price than printers of similar performance. For the time being, only the technique is being demonstrated and CII-HB will not be rushed into putting on the market a printer which, although still only a prototype, can already pring a set of 256 characters. We will have to await year-end 1983 for the company to market a competitive printer.

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CSO: 3698/7

CII-HB PRESIDENT OUTLINES COMPANY STRATEGY

Paris ELECTRONIQUE ACTUALITES in French 24 Sep 82 pp 1,9

[Article by P.S.:"CII-HB: The Same Strategy and the Means to Apply It"]

[Text] CII-HB /International Data Processing Company-Honeywell Bull/ announced that it will start marketing three new computer models for small and medium-size enterprises, the DPS 4/21, 61 and 82 systems, as well as a new disk unit (60-120 million bytes) for the OEM [Original Equipment Manufacturers] market. CII-HB also just introduced two new word-processing systems on the office-automation market.

The new CII-HB president, Mr Stern, took this opportunity to state again the guidelines of his company's strategy, a strategy which must be viewed in its context if it is to be distinguished from that of Mr Stern's predecessors.

The new CII-HB strategy does look like the company's strategy as it was defined in the early 1970's by Mr Desbrueres, one of its former presidents. CII-HB still intends to provide its customers with global solutions, and intends to be represented on all computer and communications markets; CII-HB does not plan to emphasize compatibility with IBM, it still ambitions to offer an alternative to IBM, and it plans to emphasize open-ended networks that will enable different systems to coexist.

The difference between now, yesterday and long ago still does exist, and it is considerable. Today, CII-HB can establish a long-term industrial and marketing strategy. It is no longer compelled to follow the designs of a foreign partner. It no longer has to perform financial acrobatics as a result of the short-term views of shareholders groups.

As a result of this difference, the strategy remaining the same otherwise, the company's policy can now be more oriented toward users' requirements. "Quality will be our major criterion for success in meeting our customers' increasing demands, and we shall reject palliatives that would be only cosmetic improvements," Mr Stern insisted at a press conference.

As far as products are concerned, CII-HB intends to broaden appreciably the scope of its catalogue, both on its own and by taking advantage of the synergistic effect caused by the electronic systems industry.

"CII-HB will not do everything," Mr Stern stated, "but it will not wait for a market to exist to get interested in a new product."

As far as minicomputers are concerned, the company intends to become the leading supplier of the domestic market with the new line that will result, in three years from now, from the convergence of its own models and those of SEMS [expansion unknown] which it will take over.

As far as microcomputers are concerned, production rates at its R2E [expansion unknown] subsidiary will progressively increase from 15,000 to 100,000 units per year (a 16-bit word model has just been announced).

In office automation, finally, CII-HB believes it has a good marketing potential, "for none of our competitors has yet achieved a dominant position."

Beyond these considerations, the most interesting in what Mr Stern said is his vision of the future. The 1980's, he said, will be marked by the development of new applications (voice, image), domains in which no one now holds a dominant position and where, therefore, everything is still possible; the 1990's will be marked by the advent of systems for the layman, and will rely on software developments and product and service quality.

His appreciation of the European market is also interesting: three-fourths of this market are now held by non-European companies; this proportion should be brought down to 50 percent, he stated, emphasizing (as his predecessor, Mr Brule, had done) that European manufacturers could cooperate to achieve these objectives, and that such a cooperation might be easier when seen from the angle of open-ended networks.

Answering a question about a different subject, Mr Stern stated that CII-HB (which has financial expenses amounting to 10 percent of its total sales, due to the fact that it lacked its own capital under the previous management) would recover its profitability within the next five years while carrying out its normal operations.

New Products

With respect to computers as a whole, CII-HB has just added three new business computers to those it already offered: the DPS 4/21, DPS 4/61 and DPS 4/82 systems. These new systems are more particularly intended for the small and medium-size enterprises/industries market.

The DPS 4 line, all models of which use a new version of the GCOS 4 operating system, offers a large variety of emulation, conversion and translation tools for other CII-HB or competitive systems. The whole DPS 4 line is featuring the 64 K bit MOS [metal-oxyde semiconductor] technology and a telemaintenance

system. A new 650-lines/min OCR [Optical Character Reading] character-band printer developed by CII-HB is offered on all DPS 4 models.

In office automation, the new TTX 35 station, developed and manufactured in France by CII-HB, is a stand-alone word-processor, a word-processing terminal and a data-processing terminal, all in one.

At the top of the TTX line, CII-HB introduces a new word-processing system, the TTX 90. This system, which is fully compatible with TTX models 60 to 85, also features the latest ergonomic improvements with respect to keyboard and full-page display utilization. The TTX 90 system is offered in four different versions, depending on the size of the core memory (96 and 128 kilobytes), the number of floppy disk drives (one to four 315-kilobyte floppy disks). A 5 million bytes Winchester disk is available as an option.

As far as peripherals are concerned, CII-HB has announced new products for the OEM market. The announcement concerned a disk unit in the Cynthia D 100 line, and four new "Easy Box" disk subsystems.

The Cynthia D 165 provides the user with 60-120 million bytes formatted on fixed (10-1/2 inch) Winchester disks.

9294
CSO: 3698/12

THOMSON-CSF EXPORTS TURNKEY IC MANUFACTURING PLANTS

Paris ELECTRONIQUE ACTUALITES in French 24 Sep 82 p 20

[Article by J.P.F.: "How To Export Turnkey Printed Circuit Manufacturing Plants"]

[Text] The exportation of components or machines does not have to be limited to products. It can also focus on technology accompanied by plant assembly on foreign sites; this is what CITEC [expansion unknown], Thomson-CSF [General Radio Company] subsidiary, has chosen to do for printed circuits. To meet the demand, this company just invested over 2 million francs in a computer-aided circuit-design system that will include computer-aided drafting, computer-aided methods and the final imprinting of the circuit.

A Showcase

To enable prospective customers to evaluate the performances of the plant as a whole, the company manufactures and markets printed circuits. To such purchasers, CITEC can provide a turnkey plant including the buildings, the industrial knowhow (including documentation and technicians-training lasting from 6-8 weeks to 6-8 months), on-site technical assistance, equipment and spare parts. On the average, instalment payments from such projects now provide the company with 40 million francs per year. CITEC manufactures printed circuits for marketing and its 1981 sales amounted to 35 million francs. In 1982, this figure should exceed 40 million francs.

Its production is oriented to the computer, telephone, defense and professional markets. The technologies used cover the whole range of the present state-of-the-art; in particular, the company is about to start producing Class 5 printed circuits consisting of three conductors between two chips placed 1 inch apart.

For computer-aided circuit design, the company is using as "heart computer" a VAX 11/750 with 2 megabytes of storage memory; the graphic station is a Redac and, for simple operations, the company uses a specialized bottom-of-the-line system, the Cadet. For computer-aided drafting, the company uses a PDP 11/34. This system will become operational late in 1982 and represents an investment

of over 2 million francs. It will be used to design printed circuit boards but also for methods management (how to manufacture the product) based on data provided by the "heart computer," and to manage the electrical testing of the boards. This computer-aided design system will replace a complex system still used by CITEC, and the "electronic heart" of which is located near Paris. The new system will be located within the company. The software used is the standard Redac software; eventually, it will be replaced by software now being developed by Thomson-CSF.

As far as it is concerned, CITEC does not seem to suffer from present economic conditions and especially from the reduced activity which affects several printed-circuit manufacturers.

Rather, the company seems to have difficulties in meeting the demand and its order books cover approximately four months.

9294
CSO: 3698/12

REORGANIZATION OF MINISTRY OF RESEARCH, INDUSTRY ANNOUNCED

Paris LE MATIN in French 9 Sep 82 p 2

[Article by Olivier Péretié: "Chevènement Redeploys His Ministry"]

[Text] Three major directorates -- research, industry, and energy -- have been set up. Jean-Pierre Chevenement, Minister for Research and Industry, yesterday told the cabinet about the way he plans to reorganize his super-ministry. As of now, it will be run from three general directorates: research, industry, and energy. Louis Gallois, hitherto the minister's chef de cabinet, becomes director general for industry. He is replaced as chef de cabinet by Loïc Hennekine.

The Ministry of State for Research and Industry now consists of three major divisions: the Research and Technology Directorate, child of the old Research Ministry, is now headed by Roland Morin, 50, an Ecole Nationale alumnus, Audit Office counsel, and economics professor at the Ecole Nationale for Political Science. The General Directorate for Industry tops the three major directorates of the old Ministry for Industry: the DIELI (Electronics and Computer Industries Directorare), the DIMM (Mining and Metallurgy Directorate), and the DICTD (Chemicals, Textiles, and Miscellaneous Industry Directorate). The much-talked-of DGI was the brainchild of Michel D'Ornano, and was headed at various times by such men as Hugues de L'Estoile, now boss of Dassault-Breguet, and Jean-Pierre Souviron, who is now at Matra. Under the tutelage of its string of directors, the DGI had become something of a state within a state on the Rue de Grenelle. That state of affairs came to an end under Pierre Dreyfus, Jean-Pierre Chevènement's predecessor, and under his chef de cabinet, Loïck Le Floch, to be replaced by a less activist General Directorate for Industrial Strategies.

The new DGI, they vow at the Industry Ministry, will not be a clone of the old one. In any case, Jean-Pierre Chevenement has turned it over to a man on whom he can rely: his own former chef de cabinet, Louis Gallois. At 36, this graduate of the prestigious National Commerce School has never tried his hand at private or even state-owned industry. He has, however, spent 2 years as France's

ambassador to Tokyo, and since then has been handling matters relating to French investments abroad -- and foreign investments in France -- at the Finance Ministry.

The Japanese model, which Jean-Pierre Chevènement so loves to cite, is one with which his new chef de cabinet, Loïc Hennekine, is thoroughly familiar. This 42-year-old Bordeaux native, also product of the Ecoles Nationales, spent some time himself as top man in the French embassy in Japan from 1979 to 1981, before he switched to international matters at the Industry Ministry.

The third general directorate, which deals with energy and raw materials, is already a going concern. It is still headed by Jean Syrota, a Polytechnique graduate, mining engineer, and former boss at the DAII (Directorate of International Industrial Affairs) in the Post Office and Telecommunications Ministry under Giscard, where he replaced ... Jean-Pierre Souviron. The ministry will also cover five services, all of them available to the three general directorates: a general administration directorate, a regional affairs directorate, an international affairs directorate, a scientific and technical mission, and a forecasting and evaluation center.

6182

CSO: 3102/446

WORK CONTINUES ON FRANCE'S NEW INDUSTRIAL POLICY

Industry, Research Representatives Meet

Paris LE MATIN in French 21 Aug 82 p 4

[Article by Henry Lauret: Chevènement Stirs Up Industry]

[Text] Big shakeup in Jean-Pierre Chevènement's Ministry for Research and Technology. Today he welcomed the presidents of the nationalized corporations and the directors of all the major government research agencies. On the agenda: his new industrial policy and its funding plans.

Chevènement up against the wall. The Minister for Research and Technology today invited 15 presidents of State-owned corporations and 15 research agency directors to sit down at his conference table. On the menu: industrial policy, its shape, and its goals. Right now, as Pierre Mauroy's government blazons its determination to get French industry back on the international competition track, we all know the rôle that is fated to fall to the public sector (which now accounts for 32 percent of French industry and 60 percent of French industrial research).

The left, which decreed expanded nationalization by taking over Saint Gobin, Rhône-Poulenc, CGE, CH-HB, PUK, and Thomson, now has its hands on an extremely powerful, albeit fairly cranky lever. That being the case, it is up to the left to begin by spelling out the rules of the game. We still have no clue as to how they plan to do it, even though the ante the State has put into the pot (12.4 billion francs) is common knowledge, even though the Minister for the Economy and Finance recently distinguished himself by presenting a plan for channelling what there is of available savings into industry.

The deep red tinge of the books in a great many of the sectors involved -- steel, energy, automobiles, data processing, chemicals, consumer electronics -- gives some hint as to the size of the challenge. What really troubles French industry is, in many cases, its failure to adapt. It is, in almost every case, its lack of

competitive gumption. This means that its structures must be trimmed and tailored accordingly, if there is a real intention to make the public sector play the part of prime mover for all of industry, which is the rôle in which it seems to have been cast. On both sides of the fence, modernization of the productive apparatus tops the list of priorities: it would indeed be futile to count on any return to really competitive stance without investing in our factories.

It would be equally fatuous to hope that, by some wave of a magic wand, our technological lag might be dumped on such partners -- and rivals -- as Japan, FRG, and the United States. The sorry state of our foreign trade -- 52.3 billion francs in deficit since the start of this year -- bears witness to that stark reality: French industry simply is not geared to respond to every little tremor in the consumer market. In place of the old, long-discarded slogan about winning back the home market, it would be better to talk about winning some foreign markets. If we can't do that...

Jean-Pierre Chevènement knows all this. So do the people he must talk to. Their job is the harder in that it would not be a good idea to miss the boat yet again. In the past, all attempts to get our foundering industry afloat again have come to naught, in most instances through lack of consistency or money. The left has bet its all on nationalized industry because it was certain that this was the best way to break free of short-term constraints and get at the root of the problem.

The future will tell us whether or not this radically different choice was the right one. The presence around a single table of the big bosses in research and industry stems from the same logic: genuine synergy between research and industry is indeed the sine qua non for restoring some tonus to our flabby industrial muscle.

Six New Public Groups

Paris LE MATIN in French 31 Aug 82 p 4

[Text] CII-HB Its president: Jacques Stern. Degrees from the Polytechnique (Sup-Aero) and Harvard. Founder of a major data-processing service company, SESA, he is thoroughly cognizant of all aspects of computer technology, including the user viewpoint.

The Corporation. C.A. in 1981: 7.3 billion francs. Losses: 440 million francs. Payroll: 16,200. The flagship of France's data processing and computer industry will have to review its strategy, win back its technological independence from the Americans, and update its production lines. The government plans to make it the magnetic core of the whole computer industry by regrouping and consolidating the activities of Thomson and the other companies active in computer technology and by contracting European alliances. To face up to the ubiquitous IBM, CII-HB will concentrate on small and medium data processing equipment and on networking. As it toes its Nth starting line, the corporation is in a very delicate position.

France was split in two: consumer electronics (television, hi-fi, appliances) went to Brandt; the professional sector (avionics, telephonics, and components) to CSF. These are strategic sectors in which practically all the major decisions are still to be made. What kind of international alliances will have to be contracted to stand up against the Japanese and the Americans, both in components and in consumer goods? Which branches will have to be pruned (telephonics ? computers? medical?). And, finally, how to go about restoring some competitive stance to a corporation whose military contracts are the only ones that show a consistent profit?

Rhône-Poulenc. Its president: Loïc Le Floche-Prigent, 39 years old, an engineer by training. There were no visible portents to indicate that this civil servant, who rose through the ranks of the General Delegation for Scientific and Technical Research (DGRST) would become manager of one of the largest industrial conglomerates in France, except perhaps his closeness to Pierre Dreyfuss, whose chef de cabinet he was for a time.

The Group. C.A. 1981: 35.9 billion francs; payroll: 89,340. Losses: 335 million francs. For a time very well placed in certain areas of chemicals and pharmaceuticals, Rhône-Poulenc spent all its corporate muscle in the worldwide crisis of the textile industry. With some fairly brutal clear-cutting operations connected with restructuring, the group headed out along a path that has led it increasingly into conflict with the unions, particularly since 10 May 1981. Its former president, Jean Gandois, has finally decided to leave. Now that it has shed its heavy chemicals interests, the group must demonstrate that, even without all the funding Gandois demanded, it can complete its corporate metamorphosis in such sectors as refined chemicals and biotechnology.

Pechiney-Ugine-Kuhkmann. Its president is Georges Besse, 54, a Polytechnique and School of Mines graduate. Working under André Giraud, he has built a reputation as a demanding, pragmatic manager. Moods are not his strong point. His experience as head of Cogema, a subsidiary of the Atomic Energy Commission (AEC) has earned him a reputation as a financier, but as an industrialist as well.

The Group. C.A. 1981: 41 billion francs; Payroll: 71,000. Losses estimated at 1.7 billion francs. An omnium-gatherum conglomerate, its interests range from aluminum and copper processing to chemicals, by way of nuclear energy and light industry. Its widely scattered plant and its obsolescence led it to get out of special steels (now in Sacilor's hands). The problem of chemicals is still up in the air; it has become a financial abyss, and the government wants Elf-Aquitaine to take it over. There will be major restructuring surgery prior to reconcentration around aluminum and nuclear power.

Saint-Gobain. Its president is Roger Faroux, 55, alumnus of both the Ecole Normale Superieure and the Ecoles Nationales, he is also a theologian. He speaks with the zesty Gascon accent of his native region and is, now that it's over, the only man of his ilk to survive the leftist massacre. He is one of the select breed of great managers. An astute politician, he has always had a gift for choosing his aides and for taking care of his friends.

The Group: C.A. in 1981, 43.5 billion francs. Payroll: 135,000. Profits: 450 billion francs. One of the grandes dames of French industry, Saint-Gobin took a rejuvenation cure when it plunged head-first into the computer field (taking over CII-HB and buying a 35-percent interest in Olivetti). Its traditional fields glass, insulation, packaging, paper, lumber, cast iron) can boast, even now, of remarkable self-financing capacity. It is, however, wholly committed to "soft growth." Now that the government has severed all its links with electronics for the future, the group will have to go looking for another growth area within reach of its means and ambitions.

Compagnie Genérale d'Electricité. Its president, Jean-Pierre Brunet, 62, is a graduate of the Navy School and holds ambassadorial rank. The former diplomat and labor activist (CGT) now heads one of the giants of French industry. As successor to Ambroise Roux, he is by no means a born captain of industry. His job is to make sure the transition is a peaceful one.

The Group: C.A. 1981 57.6 billion francs; payroll: 184,000; profits: 586 million francs. The CGE galaxy covers fields as disparate as electric construction, shipyards, public works, water management, office technology, and telecommunications. Often perceived as a financial holding company, the empire built by Ambroise Roux and Georges Pébereau must first of all affirm its industrial calling. No question but that CGE was alone (save for Saint-Gobain) among the newly nationalized companies to show a profit. But will it be able to lay its hands on enough resources to keep its place among the traditional sectors of the economy, and at the same time grow still bigger in future-oriented telecommunications and office systems?

Thomson. Its president is Alain Gomez, 43, another "énarque," co-founder, with Chenènement and a handful of others, of his party's Center for Studies, Research, and Education (CERES), he is described as a tough man, a hard driver. Plucked out of the general staff at Saint-Gobin, he has, in a matter of a few months, mastered the subtleties contained in the thick files of the electronics industry. As of 8 September, he will be absolute master of the group following Bouyssonie's ouster.

The Group: C.A. 1981: 43.6 billion francs; payroll: 130,000. Losses: 168 million francs. The biggest electronics firm in

Nationalized Industry's Major Rôle

Paris LE MATIN in French 31 Aug 82 p 5

[Article by Eric Le Boucher and Olivier Péretié : "The State as Boss. Public Sector Does 32% of French Industry's Volume of Business."]

[Text] What is the great sweep of nationalizations supposed to accomplish? More than a year has passed since passage of the public sector expansion act, but the government has yet to come up with the definitive version of its "grand" industrial policy. And yet, with 80 percent of steel, 84 percent of aeronautics, 54 percent of basic chemicals, 40 percent of electronics, and in all 32 percent of French industry, the state has never yet gathered into its own hands so many sparkplugs to get the whole economy rolling again.

Picking up the industrial challenge of the Eighties means, for the government, creating jobs, winning back France's technological independence, making a fresh start on research and investment, and changing labor-management relations within the companies.

It's a vast program, one in which the national corporations are cast as both spearhead and prime mover. For several years, now, for that matter, the public sector has done a little bit better at its mission of industrial development than the private sector has.

For example, from 1976 to 1980, the old public corporations increased their investments by 121 percent in current francs, as compared with 64.4 percent for all industrial concerns and a mere 46 percent for the corporations that are nationally owned today. The same story holds for the jobs picture: employment at the newly nationalized companies declined by 11.9 percent over the same span, while jobs in the public sector rose by 2.1 percent... Of course the major projects, such as nuclear power plant construction, had a lot to do with the gap between the two sectors. The fact remains, however, that these figures provide cogent arguments for the new government's decision to rely on an expanded public sector as the foundation for its new policy structure.

Simple logic, though, requires that two conditions be met if any such policy is to succeed: give the national corporations the money they need for their growth -- if not their survival; and once and for all, draw up and publish the list of sectors targeted for special effort. As of now, there are no indications that these conditions are being met. It was perhaps with an eye

to resolving those doubts that Jean-Pierre Chevènement today summoned the bosses from all the national corporations to confer with him.

It's going to be a tough job. In 1982, the national corporations are going to need close to 15 billion francs, just to balance their often catastrophic books, except for CGE and Saint-Gobain They will get only 6.4 billion francs in the form of capital endowment and 6 billion in the form of participatory loans from the banks. The lack of funds may be even more acute in 1983, when capital contributions will amount to only 7.5 billion francs to cover needs estimated at 20 billion....Will Delors' plan to tap the thrifts for investment funds be enough to fill the gap?

As for the strategic options, mystery still cloaks the reconstruction plans for most sectors, particularly electronics, telecommunications, chemicals, etc.

What will the final answer be on Elf-Aquitaine's takeover of chemicals from PUK? Will Thomson hang onto telectronics? Will it become the great core company for all of the electronic components industry? These are just some of the many questions that have yet to be given specific answers.

The state, which now controls 80 percent of steel, 84 percent of aeronautics, 75 percent of synthetic textiles, 43 percent of basic chemicals, 40 percent of electronics or 35 percent of glass, will simply have to face up to some truly dire decisions. And hence it must perforce impose its will.

What will be left, once that is done, of management autonomy as promised by the President when the nationalization act was passed? That is a question bound to be very much on the minds of all the bosses Pierre Chevènement summoned to his office today, and the answer to it will determine the cast of French industrial socialism.

6182

CSO: 3102/450

VW, NISSAN DISCUSS WORLDWIDE COOPERATION

Hamburg DER SPIEGEL in German 30 Aug 82 pp 64-65

[Article: "Join Forces"]

[Text] VW and Nissan, Germany's number one and Japan's number two among the automobile makers, are joining forces.

Host Takashi Ishihara, president of Japan's Nissan automobile concern (Datsun), expected a great deal of the visitor from Germany. Officially, the trip to the Far East that Carl Hahn, the new VW boss, undertook in July was treated as an introduction visit accompanied by a plant inspection. In fact, however, the two automobile bosses wanted to reach an agreement concerning worldwide cooperation of the two concerns.

The move was prompted by two competitors. The managers of VW and Nissan are concerned about the fact that General Motors, the world's biggest automobile concern, and Toyota, the leader of Japan's automobile industry, are intensifying their contacts.

The planned liaison between the two giant automobile makers is intended to develop joint production and marketing strategies in the world's key markets. Moreover, beginning in 1984, GM's Detroit assembly lines are to turn out the first Toyotas.

Ishihara impressed on his visitor the need for VW and Nissan to follow suit and join forces; he said the cooperation between Germany and Japan should go far beyond the agreements signed in September 1981.

A year before the conclusion of that agreement, Hahn's predecessor, Toni Schmuecker, had made an arrangement with Ishihara, according to which Nissan may build VW's Santana model for a licensing fee of approximately 4 percent of the production costs. Wolfsburg will supply the engines and transmissions.

Beginning in October 1983, Nissan robots will be welding and screwing together the Santanas in the Zama Plant near Tokyo. The assembly volume projections provide for 4,000 vehicles per month and by 1986, the output will be increased to 8,000.

The managers of the two concerns now want to go beyond the modest Santana cooperation and establish a real linkage. The plans range from joint assembly to reciprocal supply of automobile parts. Ishihara brought up and discussed continent after continent to show the advantages offered by cooperation.

The most serious concern of the Japanese manager is the marketing difficulties in the United States: To protect its own automobile industry, the American Congress wants to establish import barriers. A recent bill restricts every foreign concern to an annual import quota of 100,000 vehicles. Three of every four parts of each additional car sold by the producer in the United States must then bear the "made in USA" seal.

This would make things difficult for Nissan. For this year Japan's number two will be shipping approximately 450,000 Datsuns to the United States. Even if the new Nissan plant in the U.S. state of Tennessee--designed to turn out approximately 250,000 vehicles--is put into operation next year, the Datsun sales would still exceed the import limit.

VW could help by supplying its partner with production installations for assembling Datsuns made in USA. VW's Westmoreland Plant, which is designed to turn out 230,000 vehicles, presently operates below the 50-percent capacity utilization level. On account of the drop in demand, a plant VW bought 2 years ago in the U.S. state of Michigan presently is not utilized at all.

The assembly aid would generate income for VW, while Nissan could quickly obtain an additional production plant.

In Asia, on the other hand, where VW never stood a chance against Japan's fleet of compact cars, Nissan could help the Germans to gain a foothold. According to the conception of the VW managers, Ishihara would have to expand the Santana production. Wolfsburg then would sell the VWs made in Japan via Nissan's marketing network in Asia. The Santanas for Australia could be produced by Nissan's Australian plant, a former VW plant.

The two partners want to join forces in Africa as well. In the VW plant in Nigeria, capacities are available for Nissan. The plant--designed to accommodate a daily assembly volume of 100 cars ("Bug," "Passat" and "Audi 100")--presently operates at no more than 50-percent capacity. Due to the lack of demand, the Wolfsburg concern, which controls approximately 25 percent of the Nigerian automobile market, was forced to cut back production by over 36 percent during the first 6 months of the year.

Nissan, too, was forced by the slump in West Africa to change its marketing strategy. Instead of erecting its own plants, for which it has now obtained the construction permit, the concern wants to use the facilities of its partner, which then would assemble Datsuns as well.

It appears that even in Latin America, which so far has been the domain of VW do Brasil, partnership with the Japanese soon will no longer be a taboo subject for Wolfsburg. VW finds itself confronted with a challenge in its Latin American territories. For the Toyota compact cars produced by General Motors are to be sold in all the markets from Mexico to Brazil. Nissan, too, is pushing strongly to obtain a share of the Latin American market, which so far has been neglected by the Japanese. Ishihara's concern could sidestep an expensive and risky construction effort and lean on VW. For the VW plant in Sao Paulo likewise operates only at the 50-percent capacity utilization level.

In the view of VW's head planner, Siegfried Hoehn, it is only natural that General Motors and Toyota as well as Nissan and VW are now pooling their resources: "In the automobile industry, the need for capital is so great that there is going to be more risk-sharing."

To be sure, the cooperation with the Japanese is not to go too far. In Europe, the two concerns will continue to operate independently.

The Wolfsburg managers thus hope that Nissan will drop its plan to build a plant in Great Britain. After all, VW does not plan to build plants in Japan.

8760
CSO: 3102/445

PARIS AUTOMOBILE SHOW FORESHADOWS FUTURE

Paris L'HUMANITE in French 29 Sep 82 p 11

[Article by Jacques Moran: "Where Is the Automobile Industry Going. Models at the 1982 Show Foreshadow the Future. The Car of the Year 2000 Is Born"]

> [Text] In a first article,* we saw how French manufacturers allowed their foreign competitors to get the better of them on the French market, even though the scenarios were different for Renault, a national enterprise, and Peugeot-Citroen-Talbot, a private group. A glance at the Show, where new French models are few, reveals it. Yet, now that the car of the next decade is shaping up and beginning to come out of the plants, it is not the moment for our automobile industry to mark time.

"That was in 1982. The Show was still at the Porte-de-Versailles fair grounds," people will say in 10 years from now, to place the beginnings of the latest automobile revolution. Certainly, at first sight, nothing was obvious. At first, the hundreds of thousands of visitors at the 69th Show saw only cars like any other cars, or almost, cars with four wheels, one (gas!) engine, one trunk. Old models were shown along with the new, the R 4 next to the Audi 100. They had to take a closer look, to pay attention, to listen. All the more so as Renault, the first European manufacturer, had not even taken the trouble to delegate salesmen to its booths. But the R 18, the R 5, the R 9, none of these were new. Where was the change? It was everywhere.

This time, the car of the year 2000 is born. Too bad for the dreamers: it is fitted with four tires, it runs on gasoline or on gas-oil. Nevertheless, the 69th Automobile Show is teeming with signs that foreshadow the future.

Mutants Reach the Market

Fertilization took place in 1976-1978. Gestation progressed, not without problems at Rueil, Villacoublay, Sochaux, Wolfsburg, Detroit, in research centers then in plants, Douai, Rennes, Sochaux, etc. The firstborns, all mutants, are reaching the market. The revolution began with computer-aided design. It

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* L'HUMANITE dated 28 September.

continued with robotics. Finally, just around the corner, are electronic gadgetry, the TV-screen like dashboard, the talking car. Around the corner is next year's 505 turbo-injection car with a speech synthetizer.

The computer displays a mathematical prototype on the screen, a sort of skeleton of the car to-be. And it bends and stretches it, and calculates accurately the forces exerted on every point of material, on every imaginary piece of sheet-metal. Before, a real prototype had to be built to check all the engineering data. And computer-aided design has changed a lot of things. The R 9 was the first car to take full advantage of it. Then, there was the BX, the new 305.

Sheetmetal and Gasoline Savings

For instance, the weight of the BX could be reduced by 400 kg compared with that of the CX. Tens of kilograms of useless sheetmetal were sacrificed. Renault estimates that it has thus achieved a weight gain of 35 percent on the front shield alone, 10 percent on the headlights. It was also used to improve soundproofing, even before prototypes were built. Aerodynamics and the massive use of lightweight plastics, which is now common (for instance in the BX hood and tailgate), have resulted in ever lower fuel consumptions. The engines have been redesigned and electronics have entered them in force. Distributors now come without a switch (and therefore need no adjustment). Microprocessors will inject the exact amount of fuel required at a given time into the cylinders. The car with a consumption of 3 liters per 100 km, planned for 1990, is almost here. The Vera Plus presented at the Paris Show by Peugeot uses 3.5 liters [per 100 km] at 90 km/h, with a top speed of 158 km/h.

Toward the Small World Car

And the nicest products of this new technology have not yet seen the day. Unfortunately, small cars, bottom-of-the-line cars do not yet receive the full benefit of all its spin-offs. Designed at the end of the 1960's, and brilliant at the time, the R 5, the 104, the 127 and the Golf are showing increasing signs of old age. They have had their day. The four major European manufacturers are working on the small car for the 1980's which, however, is not yet ready. In the meanwhile, foreign cars have come to stay. The Panda, the Metro of British Leyland, the Polo of Volkswagen have managed to capture a portion of the market. They are still not representative of the generation of small world cars, but we are getting there. The plants, the labs are ready. The Corsa is a first start in this direction. Opel-General Motors invested 2 billion francs in this very first minicar ever built by an American manufacturer. The result may not be equal to expectations, but General Motors is entitled to a few mistakes.

The 69th Automobile Show is also a festival of new models, some traditional, some original, surprising, especially among top-of-the-line cars, due to the high cost of the new technologies.

Bottom-of-the-Line Turbocars

The small car remains traditional. The Samba and the 104 ZS gain some extra horsepower, and turbocompressors are as promising as ever. When it comes to popularizing turbocompressors, Renault is number one with no less than seven models (including two Diesels) equipped with a turbocompressor. British Leyland has brightened up its Metro which becomes more luxurious with the Van den Plas, and the Panda Super is being added to the other four Pandas which now have a more flexible rear-suspension. Volkswagen, which created a stir with its Audi 100, is now using turbocompressors on all its Diesel models, from the Golf to the Audi 80. The German manufacturer is thus the first to offer supercharged bottom-of-the-line Diesel models. Volkswagen has also equipped its Golf GTI, Sirocco GTI and Jetta GLI with more powerful engines (112 hp). The new 305 will not go unnoticed, even though changes are hardly visible from the outside (the dashboard and radiator grill alone differ from those of the former model). The innovation resides in the front axle which can now receive the new Volkswagen engines, and the first among them, the Diesel engine which imparts a surprising youth to the SRD. The Horizon also features this engine.

The Japanese, too, are concocting a few interesting things. The Nissan Prairie foreshadows the typical small car of the 1980's. Also, Chardonnet is importing into France a Zastava Yugo 45 at a price which might prove absolutely unbeatable.

The R 4 Again...

France Motors, which is already importing Mazda cars, is also offering a 3-cylinder 52-hp Innocenti. And then, among bottom-of-the-line cars, the R 4 can still bear comparison with its younger siblings. The R 4 has been given front disk-brakes and a new dashboard to start its umpteenth new career. Why not! When it comes to roominess and functionalism, nothing more original has been invented since the R 4.

Too bad that the small car, so discredited among manufacturers (it does not bring in enough profit, although Talbot and General Motors appear to have changed their minds on this), has not been the first to benefit from the extraordinary technological revival of the decade. Of course, this would imply an increased sophistication of products which are already very carefully designed.

The Talking Car

That revival is more clearly perceived on top-of-the-line models. The BX, Sierra, Audi 100, 505, are its first offspring.

Does that mean we can hail an awakening of French manufacturers? Citroen is engaged in quieter revolutions and, for the first time with the BX, shows concern for its customers' needs. As for the Peugeot-Talbot group, it seems to have emerged from a prolonged state of lethargy to start rejuvenating its models. The 505 turbo-injection model with a speech synthetizer and the Vera

Plus (an economy car prototype, 3.5 liters [per 100 km] at 90 km/h) show that imagination is no longer buried in the drawer of a dusty desk at Sochaux, as recent events had led us to believe.

Is there any awakening worth mentioning at Renault? Thanks to Renault, the French automobile industry has been able to hold on to what it had conquered, and the R 9 can look forward to a very bright future, in spite of the dull design of its body (or maybe because of it). Renault has been the first manufacturer to dare use a turbocompressor on the average man's car, the Renault 18. It is continuing this policy on the Model-20 Diesel car (after the Model 30), and adds automatic operation to the Diesel engine on the 18 GTD. Renault is far ahead in certain technologies but, unfortunately, as the 1982 Show demonstrates, the Renault line is getting old. It lacks a modern gas engine, which all its competitors have managed to build. The most obvious sign, and a cause of concern for Renault management, is the decline of the R 5 which dominated the European market for a decade.

"German..."

Foreign manufacturers are quick to take advantage of these hesitations, these mistakes, the Achilles' heel of the French industry. Indeed, Opel does not hesitate to exaggerate these weaknesses by acknowledging what it considers to be one of its main assets. Advertising for the Ascona begins like this: "German..." A slogan that would have been unthinkable 10 years ago. Volkswagen, however, is more threatening. The leading importer into France, Volkswagen regularly takes a bite at the right spot, with modern and carefully designed products. The Polo, the Santana, the Audi Quattro, the Audi 80 Diesel turbocar have contributed to make the German firm's image far more attractive, which was not the case 10 years ago. The Audi 100, the last small marvel from the other side of the Rhine, the most aerodynamic of all mass-produced cars which, like the BX, uses many lightweight materials (it is 50 kg lighter than the former model, and more roomy), will be one of the attractions of the Show.

The Americans To Be Taken Seriously

The cars of the future will look like the BX and the Audi 100, with far greater sophistication, additional weight reductions, higher-performance engines and ridiculously low fuel consumptions. The road is opened.

Ford is not any less ambitious. The success of its Escort has shown that the Americans should not be taken lightly, even if they do not quite comply with canons of comfort as the French see them. The Sierra is an attempt at overcoming that last obstacle. Ford has invested 8 billion francs and, yet, if offers an advanced-design body (designed by a Frenchman), although the motorization technology used (especially the rear-wheel drive) is traditional.

Opel-General Motors, being more European, has more to offer and its Ascona deserves its present success on all West European markets. BMW [Bavarian Automobile Works], another German manufacturer, also ranks as a leader in automobile technology, with massive use of electronics, especially on its Series 7.

Competition is made still sharper by the ambitions of British Leyland (with its Metro and Rover) which is not as moribund as some would say, Alfa Romeo (with its new Alfasud), Fiat which is counting on its Panda and Ritmo until it introduces its Uno, another small would-be world car with which the French will not be able to compete for a few more months.

Warning Signals

French manufacturers have remarkable technical equipment and can take advantage of their engineers' and workers' knowhow, which is famous the world over. Besides, the models they present at the Show are better outfitted than they used to be not so long ago, with the exception of bottom-of-the-line models. The R 9 C does not feature adjustable seats, nor a sun-visor for the passenger, and the 9 TL has neither a cigar-lighter nor a trip-mileage indicator! But these are petty details which foreign manufacturers have given up a long time ago, which represents a non-negligible part of their reputation [as published].

Is this reputation well-founded or not? Car owners have been very patient. They have let Renault, Peugeot, Talbot, Citroen get away with a lot before deciding to buy a Volkswagen, an Opel or a Ford, even though after-sales service is not always what it is rumored to be.

Certainly, this has been the major disappointment at this 1982 Show which has revealed the weakness and lack of imagination of French manufacturers. At Billancourt, at Sochaux, they will find a thousand excuses for this setback, although their reasons will sound far more phony than two years ago. Actually, warning signals were lit a long time ago. Citroen was the only one to dare, with its BX. Peugeot must dare its 205, Renault its new R 20 and 30, or its second-generation R 5. Time is of the essence. The automobile industry must progress inexorably, and there will be still less room for mistakes and delusions in 1990.

9294
CSO: 3698/16

CITROEN BX INTRODUCED AT PARIS AUTO SHOW

Paris LES ECHOS in French 23 Sep 82 p 9

[Article by Airy Routier: "Citroen Is Introducing Its First Conquering Car Designed On a Common Basis With Peugeot SA"]

> [Text] Like every even year, the Paris Show will open its doors from 30 September to 10 October. Seldom have so many new models been presented for the first time at the show during the past 15 years. Four important models--important on various accounts--will be unveiled. The Opel Corsa marks the entrance of General Motors on the European compact cars market. With the Sierra, replacing the Taunus, Ford-Europe is exchanging the soap box for advanced aerodynamics while still retaining--why?--the traditional rear-wheel drive. Advanced aerodynamics too for the new Audi 100 which, for its part, shows considerable technological progress
>
> Fortunately, France is not missing in this great renewal. Citroen is introducing its BX, interesting in many respects, the first of a series of new French vehicles which, it is hoped, should mark a new start for this private group and, therefore, for the French automobile industry as a whole.

The challenge was taken up. Here it is, the first Citroen entirely designed on a common basis (understructure, suspension architecture, engine block) with the Peugeot SA group as a whole. It comes late--seven years after the merger of Peugeot and Citroen, a long genesis.

But the result is here, and it confirms the commitments made by Jean-Paul Parayre, the group's president. Obviously, the BX has retained characteristics peculiar to Citroen, while taking advantage of a scaling down of all mechanical components. This relationship with the future middle-of-the-line Peugeot and Talbot even gives it a marketing plus: it is better adapted to the tastes and habits of the European consumer and should enable the company to get out of the declining market consisting of Citroen fans and vigorously attack its competitors. The Renault 18 to begin with. The first group Citroen is a a conquering Citroen.

It has not been easy. Violence was done to the Citroen engineering department: of the four initial prototypes, the only one approved was one not they, but the Italian Bertone, had designed. All the engineering department did was adapt it for mass production. The same happened with the mechanics of the car.

Same understructure and same engine: the pill was all the easier to swallow as Citroen did not have a modern engine. Citroen wanted to retain its hydropneumatic suspension. Peugeot said OK, as long as you keep the simple and inexpensive Mac Pherson architecture. A prerequisite. Connecting the two systems was to attempt the impossible. Still, the challenge was taken up, which shows the brilliance of engineers who, from now on, will have to work under firm constraints and toward definite objectives.

Alas! You cannot manage a company like Citroen without making concessions to influential people, especially when their feelings have been bruised. So, the interior styling was left to them, in spite of the unfortunate Visa precedent. Inconvenient, dull and pretentious: a poor result, unworthy of the car.

This handicap, which company managers will acknowledge off the record, will certainly be overcome one way or the other. All the more so as the car has many qualities and marks an important technological progress, evidenced, among other things, by the massive use of composite materials to replace sheet metal. The resulting weight reduction, together with good aerodynamic characteristics, contributes to a low fuel consumption.*

Within the group, Talbot has received the first new Diesels and Citroen has been given the advantage of using the new gas engine and the new transmission manufactured in new plants built specially for that purpose. A temporary but appreciable advantage, and the double-chevron company should be able to make the most of it considering that its aggressive marketing has enabled it to outstrip Peugeot, both on the production line and on the market, and that it now represents the center of resistance of the private group, which is still facing serious difficulties.

9294
CSO: 3698/11

* Official fuel consumption at 90 km/h, 120 km/h and in city driving: for the BX: 5.6, 7.5 and 7.7 liters/100 km; for the BX 14E: 5.5, 7.1 and 8.5 liters/100 km; for the BX 16 TRS: 5.6, 7.4 and 8.9 liters/100 km.

SNECMA MAY BREAK OFF COOPERATIVE ENDEAVORS WITH GE

Paris L'USINE NOUVELLE in French 23 Sep 82 p 88

[Text] Is the SNECMA [National Aircraft Engine Research and Development Company] about to break off its cooperative program with the U.S. General Electric? Ever since Daniel Tenenbaum was appointed by Charles Fiterman, minister of transport, to head the DGAC [General Directorate of Civil Aviation], the question has been worth asking. For, according to Mr Tenenbaum, "in the area of civilian jets, in the future the SNECMA should master the technology for what is called the 'hot part,' which to date has come from American sources."

With this in mind, the government has just proposed to the SNECMA that it begin a program to develop the hot part of civilian jets. Is this the start of a break with GE? The 1971 agreement linking the SNECMA with General Electric took concrete shape that same year, with the establishment of the 50/50 subsidiary, CFM International; this holds promise for the future since the French company hopes to use the CFM-56 engine in a number of Boeing 737-300, DC-8, and KC-135 planes. That would amount to approximately 2,500 engines!

In the name of a decreased dependence, should all this be allowed to be lost? At the SNECMA, they hope that France's technological dependence [sic] will not come at that price. But even now, the SNECMA has no guarantee that General Electric intends to pursue its cooperation with France in the area of civilian engines. For GE's new president quite recently said that he prefers military engines, such as those for the B-1 bombers that Ronald Reagan wants.

Still, for the time being the French government favors the CFM 56-2K2, an engine derived from the CFM-56-2 (11.4 tons of thrust instead of 10.9 tons), which is being developed jointly by the SNECMA and General Electric for the Airbus-320 150-seat plane. "This is the best solution for this plane, for

it uses an engine that already has good performances, and we are sure that it will be ready by about 1987, which is when the A-320 should be offered to the airlines," said Daniel Tenenbaum. As for the cost, that should be about a fourth of the cost of an entirely new engine.

The government's proposal to have the SNECMA study the hot part of civilian jet engines (the French manufacturer already has this technological capability for military jets) would, in the first phase, have no objective other than to enable it to strengthen its technological position. But Mr Tenenbaum is looking further into the future. "If the SNECMA later wants to draw closer to other European engine manufacturers, it will be in a better position to do so if it has more technological freedom." It is hard not to think of an agreement with Rolls-Royce. But then how could the SNECMA maintain its cooperative program with General Electric?

7679
CSO: 3698/25

TRANSPORTATION

FARNBOROUGH: A-320 DEBATE CONTINUES, COMMUTERS COMPETE

Paris AVIATION MAGAZINE INTERNATIONAL in French 1 Oct 82 pp 20-28

[Article by Pierre Sparaco and Serge Brosselin]

[Excerpt] Exactly 50 years after the first air show sponsored by the SBAC (Society of British Aerospace Companies), and 25 years after the transfer of the show to the Farnborough airport, this year there was a very large-scale, highly professional show, which reasserted its absolutely international aims. A certain number of new items were there, but above all, for a week the exhibitors and visitors from all over the world could draw up an inventory of the good and bad, as well as the hopes, of the worldwide aviation industry. All of this was spiced by some good-quality flight presentations that benefitted from quite acceptable weather conditions. The overall result? Uncertain, like our depressed economic situation. The research facilities are pawing the ground at the starting gate, but the starting signal for an economic upturn is slow in coming. When will se see the light at the end of this tunnel?

In this difficult context, the perplexity already observed at some earlier shows was again manifested in a variety of ways. When McDonnell Douglas announced that it would not exhibit at Farnborough and would also not be at Le Bourget in 1983, this was thought to be an expression of a certain amount of ill humor, or perhaps an urgent need to save money. But even at the show, first Pratt and Whitney and then Lockheed revealed their decisions not to take part. Why? Because a large aircraft or engine manufacturer doesn't sign any contracts at an exhibition booth or in a pavillion, and because the expenses involved are reaching summits that are becoming more and more difficult to justify (about $1 to $1.5 million for a big company that really wants to put forth a top-quality image). And yet, the air shows seem more than ever to be a source of ideas that no other method can replace.

These false notes, along with some others, still do not keep us from saying that from every point of view, the Society of British Aerospace Companies certainly kept its promises. Even the general public found what it wanted to see, with some top-quality "firsts": the Boeing 757 and 767, Airbus A-310 (already presented at Hanover last spring), British Aerospace 146, Rockwell International B-1, Lockheed TR-1, and even a brilliant illustration of an innovation from the past: the first dirigible from Airship Industries.

The visitors from industry surveyed the productions of a total of 500 exhibitors, spending a good deal of time in front of models of some very ambitious projects, such as the ACA (Agile Combat Aircraft), formerly the P.110 of British Aerospace, presented in its actual size, the ND-102, the result of a convergence of thought between Northrop and Dornier. And they once again heard the operational lessons learned from the Falklands conflict. Discussions paused only when the rising decibel levels drowned out the loudest voices. Now we have to learn what we can from the Farnborough air show.

Still the "150-Seater"

For civilian aircraft, there were press conferences, statements and comments made in the pavillions, all focussed on the new generation of "150-seaters." There were floods of words saying nothing, or very little, since the situation is still at a standstill. The potential market is there (2,500 planes), the engines are not yet ready, and the companies don't have enough money. Perhaps it will all seem clearer by the end of the year, people at Airbus Industrie were saying. The Airbus documentation still continues to claim that the A-320 will be ready at the end of 1986. This would mean that a decision would have to be forthcoming in the very near future (sometime this winter), with the "launch" of the program, to use the favored expression, depending more on the quality than the quantity of the first customers. But there is still one problem that has not been resolved to the satisfaction of the European consortium: the engines to be used.

Boeing may not be using its stalling maneuvers any more; it is continuing to invest in the "7-7" (Seven Dash Seven) project which will use the B-757 and 767 cockpit, an airfoil similar to that in its most recent creations, more composite materials, and also new aluminum alloys. And it could be ready for delivery starting in 1988. Here the slippage in time has been confirmed, as the Seattle-based company says that 48 months will elapse between the starting signal and the first deliveries. So there will be no decision before 1984.

Similar comments came from McDonnell Douglas (though it had no booth or pavillion at Farnborough, it did have a representative there) which, while concentrating its immediate efforts on derivatives of the DC-9 and DC-10, feels that a "150-seater," provisionally designated the D-3300, might "perhaps" be started in 1984.

This hesitation waltz seems to be lasting much longer than was expected, accompanied by an extraordinary sort of musical-chairs game played between the leading partners. This has given new meaning to the projects of an outsider, no other than Lockheed. In close cooperation with Pratt and Whitney, the Burbank research facility is continuing its work on the definition of the Boeing-727RE (Re-Engined); transformed into a twin-jet with two PW-2037 at a cost of $12 to $15 million, this plane could provide 75 percent of the fuel savings promised by new planes of the coming generation.

Might the B-727-200, of which there are about 700 flying all over the world, offer an intermediate solution worthy of some attention? Maybe, especially if we are thinking of deliveries starting in 1985, which might appeal to buyers in a hurry. But Lockheed told us that the possible decision to take action on this will certainly not be made before 1983, and then only if a fairly large number of orders can be obtained. In that case, the B-727RE would succed the "TriStar" in the assembly facility in Palmdale, California.

What About Engines?

Still on the subject of the "150-seater," General Electric and the SNECMA, with the CFM-56 in its 2K2 variant, may be on the right track; this could well prove to be an excellent starting point. Rolls-Royce and the Japanese consortium associated with it were presenting the RJ-500, with the demonstrators continuing their bench testing. This is a difficult situation, since negotiations are in progress with Pratt and Whitney, with MTU and Fiat also waiting in the background.

May the aircraft companies have been hoping that Farnborough would act as a springboard for an agreement on a multinational 10-ton development? Perhaps. But a meeting held in Munich shortly before the opening of the show did not help to reach any agreements, and the parties involved have just been saying that contacts are continuing and that a new meeting is scheduled. So it is by no means impossible that we may witness the birth of an American-English-Japanese-German-Italian engine. It still remains to be seen whether seven companies will be

able to agree on the technical decisions and the distribution of jobs and investments. Farnborough has provided no answer for this question.

Robert Carlson, executive vice president of United Technolo es, who is well known in the aviation world for the candor of his comments, again expressed his concern. Since the coming of the first jets, he told us, a single civilian engine, the JT8D, has reached the point of making a profit, and just one other is about to do the same in the short term. Even more, the development and industrial production of a 10-ton engine now require investments of about $1 billion. In order to be successful, at least 1,200 engines must be sold, and in case a decision is made to move ahead next January, the financial equilibrium of such an operation would be reached at the earliest between 1995 and 2001. This certainly gives the industry something to think about, and here we are back to this point again, does justify some perplexity.

Fortunately for everyone, there are other outlets, other products. Airbus Industrie, whose management intentionally uses an aggressive tone, pointed out that its orders increased by 82 planes during the 24-month period between the two Farnborough shows, that the recession has not caused any cancellations but only requests for later deliveries, and that the objective for 1982 is still to place 45 planes. The A-310? In 5 months, it has totaled 500 hours of flight time, of the 1,300 hours needed to obtain its navigability certificate, and it is already as "mature" as the A-300. Even better, its performances in range, Mach number, and payload greatly exceed the contract specifications.

A specific example was mentioned by Bernard Ziegler, flight director: leaving from Madrid, a high-altitude and hot airport, with constant weather conditions, the A-310 will be able to carry a cargo 2 tons above what was planned. What about the comparisons with the Boeing 767, which have been repeated in the U.S. aviation press? These comparisons are highly subjective; they were even published before the exact consumption of the A-310 was known in Toulouse! We have had enough of these fairy tales from our competitors, added Bernard Lathiere, the managing director of Airbus Industrie.

There have been enough arguments, we won't get into the subject, the Boeing people were saying 24 hours later. But Boeing did announce a 4 percent improvement in performances of the

B-737-300 bi-CFM-56, along with the study of a B-737-400 with 148 seats which could use the 2K2 and then later, under the designation 737-500, another 10-tons of the new generation. This 747-300 is another new designation, but that is just a simple name change for the SUD version with a lengthened upper section, the first step toward a 650-seat plane, and later an 800-seat version, which are obviously being kept in reserve for better days.

Optimistic comments have been heard about the B-757 and 767. The B-757 will have its empty mass decreased by 1,655 kg, while on a 1,800-km flight, the consumption of its Rolls-Royce RB-211 535C is 3.5 percent less than predicted. With 50 passengers more than the B-727, the B-757 consumes 24 percent less fuel. The B-767, which has just been brought into service at United Airlines, will also lead to longer versions (20 to 70 added seats). So the economic outlook is grim, but still this year Boeing will deliver 180 planes and about 150 in 1983.

Fokker Against British Aerospace

There is some harsh competition on the market for more modest capacities. The clash is particularly violent between Fokker and British Aerospace. In the relatively calm environment of the industry pavillions at Farnborough, columns of statistics were presented on the F-28 by Fokker, and on the BAe-146 by British Aerospace; but the two industries are bitter enemies in a temporarily restricted market.

For the Dutch firm, Fokker, the rate of production of the F-28 could rise from 16 to 18 units a year, and its 85-seat version remains a good choice for many regional routes. In addition, the research facility at Schiphol is working on a 100/110-seat version that could be started next spring. Furthermore, a decision on a change in engine for the F-27 might be made in several months (either an improved "Dart" or the PW 100), while the F-XX project (bipropfan with 100/130 seats) is more of a long-term plan. Fokker is also maintaining its contacts with Airbus Industrie for future projects.

British Aerospace will be bringing out the ATP (Advanced Turboprop); this is a longer version of the 748 with a 64-seat capacity, powered by two PW 100/9 of 2,520 hp. It will fly in June 1985, and deliveries could begin in March 1986. British Aerospace will then be able to offer a complete family of aircraft, from the Jetstream 31 to the 748, ATP and 146, with seating capacities from 19 to about 100 seats.

For the Franco-Italian ATR-42, during the Farnborough air show orders rose to 37 units (and seven options) after the purchase of two units (and two options) by the Noumea-based firm, Air Caledonia, and the order of three planes by the Danish company, Cimber Air.

There is also some harsh competition in the commuter market. There are two big rivals which both obtained their navigability certificates during the show: the Short SD-360, which will be produced at the rate of 5 a month, and the Dornier 228-200, which is now about to begin a presentation trip, which will take it to a promising but highly competitive market: India.

Optimism also prevails about the CASA-Nurtanio CN-235; the Indonesian air force has just ordered 32 units, thus increasing its orders to 114 units, still several months before the first flight. Confidence reigns too at Embraer about its "Brasilia" (46 firm orders) which will fly in mid-1983, and at Saab-Fairchild, whose first SF-340 is to come out of the Linkoping factory at the end of this month. A similar optimism is in evidence at Havilland Aircraft of Canada, about its "Dash 8." Clearly, it is much too soon to try to summarize this year's Farnborough air show.

7679
CSO: 3698/25

BRIEFS

NEW AIRBUS TRIM SYSTEM--Airbus Industrie just announced the development of a new weight-distribution analysis and trim system which will soon be made available to Airbus clients. This digital system will automatically measure the loads on each landing gear and will make it possible to reduce crew work prior to takeoff. These data will be transmitted to ECAM [expansion unknown] and FMS [expansion unknown]. [Text] [Paris AVIATION MAGAZINE INTERNATIONAL in French 15 Sep 82 p 19] 9294

ALCOHOL, VEGETABLE OIL FUELS--The French Petroleum Institute and the Solar Energy Commission have just launched a research program on the use of alcohol and vegetable oil in engines. Vegetable oils do offer advantages, especially in the operation of Diesel engines, as they are compatible with gas-oil. The basic product will consist of rapeseed oil. Research will deal, among other things, with economic yields and the best method of use: vegetable oil alone or blended with gas-oil. The Solar Energy Commission has also committed itself to supporting SEMI[expansion unknown]-Pielstick (a company of the Alsthom Atlantique group) in its efforts to develop a large dual-fuel methanol Diesel engine. French National Railroads locomotive engines, for instance, could benefit from the results of this research. In this case, it has been calculated that they could save 140,000 oil-equivalent tons of gas-oil per year. [Text] [Paris INFORMATIONS CHIMIE in French Jun/Jul 82 p 79] 9294

CSO: 3698/16

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JPRS 82157

3 November 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 125

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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JPRS 82157

3 November 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

No. 125

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BIOTECHNOLOGY

HYBRID DNA TECHNOLOGY USED IN COMMERCIAL PRODUCTION OF HGH

Stockholm NY TEKNIK in Swedish 1 Jul 82 pp 10-11

/Article by unnamed: "Europe's First Factory for DNA Hormone"/

/Text/ The world's largest producer of human growth hormone, Swedish Kabi Vitrum, is today ready to increase the production of growth hormone more than 10 times.

A factory for bacteria-produced growth hormone has been completed in Strangnas. The factory will be the first in Europe where the controversial hybrid-DNA technique will be used in commercial production.

Growth hormone is given to children who have stopped growing. Up to now the production has been far from sufficient: The hormone was taken from the pituitary glands of dead humans.

But the hybrid-DNA technique will not result in a drop in the price of growth hormone. A patient needs 150 vials per year, and each vial costs 368 kronor at the pharmacy. No price reduction has been planned by Kabi Vitrum.

Attenuated Intestinal Bacterium

With the hybrid-DNA technique bacteria can be made to produce growth hormone. The bacterium which will be used is a variant on the common human intestinal bacterium E-coli. For safety reasons the bacterium has been attenuated so that it cannot live outside the laboratory environment. The prepared form is called E-coli K 12.

In the debate about the risks of the hybrid-DNA technique it has been mentioned that bacteria with dangerous characteristics might escape from the laboratories and spread. The DNA researchers believe this is impossible with the sensitive K 12 bacterium.

"The problem is rather to keep it alive in the factory," says Einar Wikstrom, who is head of the technical division of Kabi Vitrum's factory in Strangnas.

Lowest Class of Risk

According to the regulations of the Board of Occupational Safety and Health, this type of activity may be conducted at four levels called P1-P4, depending on the amount of hazard it is judged to present.

P1 is the lowest level, corresponding to an ordinary microbiological laboratory. P4 is the highest level with very strict hygienic requirements. Only two laboratories of this type exist in Europe, one in the FRG and one in Great Britain. The Strangnas facility is classed as P1.

As early as 1978 Kabi contacted the U.S. company Genentech, which has specialized in hybrid-DNA. The two companies agreed that Genentech would try to develop a bacterium which could produce growth hormone. If Genentech succeeded, it was to get the U.S. and Canadian market and Kabi the rest of the world. It took Genentech 1 year to produce the bacterium, a considerably shorter time than expected.

Transferred to Sweden

With the aid of enzyme a sequence corresponding to the human growth hormone was introduced into the DNA chain of the coli bacterium. (See the sketch [not reproduced].) The bacterium was also made resistant to tetracycline which is an antibiotic.

When tetracycline was then added to the bacterial culture only those bacteria survived which were resistant and had the capability of producing growth hormone. One out of 10,000 bacteria then remained in the culture. The prepared bacterial solution was then transferred to Sweden and is being multiplied here through ordinary bacterial culture.

"It probably cost around 10-12 million kronor to develop the bacterium," says Anders Eriksson, who is head of production at Kabi in Strangnas.

Final Purification in Stockholm

The production of growth hormone, which is a rather time-consuming process, takes place both in Strangnas and in Stockholm. In Strangnas a semimanufactured product is made, which later undergoes its final purification in Stockholm.

The bacterium is first grown in the laboratory in volumes of 3-4 liters, then in 50-liter inoculation tanks and at the end in the 1,500 liter final tank, which is the limit Kabi was given by the permit-granting authorities. After completed fermentation the number of bacteria is about 10^{11} per milliliter.

The solution is concentrated to 150 liters in separators. The excess amount goes to a separate tank in order to be killed off with steam, which is a safety requirement by the Board of Occupational Safety and Health.

The Bacteria Are Broken Apart

The remaining concentrate then passes through several homogenizers, which means that the bacteria are torn apart during a rapid pressure change. The breaking up is necessary to retrieve the growth hormone which is contained in the bacteria; 98-99 percent of the bacteria are torn apart with this treatment, the remainder goes into a tank to be killed.

"Sometimes we think the safety requirements are a little ridiculous, but they are trivially simple to fulfill," Anders Eriksson says.

Ten Times Greater Capacity

After sterile filtration the solution is frozen in plastic bottles and sent to Stockholm where the final purification takes place.

The capacity of the Strangnas facility is about 7 million doses annually using growth hormones from pituitary glands, which gives Kabi 70 percent of the world market. With the new hybrid-DNA technique, however, the capacity will increase more than 10 times. Twenty-four hours' production in the new facility is the equivalent of doses from 12,000 pituitary glands.

But the new growth hormone will not be marketed until 1984. Now, it will first be clinically tested for a few years.

11949
CSO: 3698/2

PROGRAM LAUNCHED TO COORDINATE, AID BIOTECHNOLOGIES

Paris SCIENCES ET AVENIR in French Sep 82 pp 13-14

[Article: "Biotechnologies To The Rescue of Microbiology"]

[Text] French microbiology lags behind and our bio-industries represent but an insignificant part of the world market. This fact is not new, and it is certainly not too early for a government to become seriously preoccupied with a situation as detrimental, in the long run, to the independence of our country as the virtual abundance [sic] [absence?] of France on the computer market.

The Douzou mission report, presented to the press at the official launching, in July, of a three year "mobilizing program" for the development of biotechnology, emphasizes the "alarming lag behind the United States and Japan," and could have pointed to the lag, which is even more serious, behind Great Britain and Germany. Our deficiencies are just as evident in the field of basic research as in industry.

The report appropriately lists sectors which have received "very little attention" from research organizations, in particular, with regard to the "application of biological reactions": growth and production kinetics, stoichiometry and yields, culture of microorganisms and cells, enzyme engineering, reactors, extraction and purification, analytical and chemical synthesis control apparatus. The report also notes, in spite of the existence of companies such as Transgene, in Strasbourg, and the Rhone-Poulenc, SNEA (SANOFI) or Roussel-Uclaf investments, the small number of firms working in this field in France and their almost total absence in certain particular sectors such as enzyme engineering.

The aim of the program is twofold: coordination and assistance. In the first place, the interministerial "Coordination Committee" will be responsible for strategy, under the careful control of a "National Committee" made up of "qualified representatives of the socio-economic forces." A "Mission" from the Ministry of Research and Industry, will manage the program itself. The latter, at the end of this year, will already account for a public expenditure of 1.1 billion francs and "if everything happens as planned," this amount will increase to 1.43 billion francs next year. The long term

objective is modest in appearance: from 7.5 percent to 10 percent of the bioindustrial world market in 1992.

The government intends to systematically encourage public and private research programs to be presented in this field. Assistance to firms will represent 600 million francs over a three year period. A series of technical bulletins marked with the "confidential secret" seal describe approximately fifteen industrial projects. Mr Chevenement has stated: "We are on the point of having available six genetic engineering companies and three companies dealing with cellular immunology."

9286
CSO: 3102/447

FIRST BIOTECHNOLOGY-PRODUCED MEDICINES IN TWO YEARS

Duesseldorf EUROPA CHEMIE in German 9 Jul 82 p 321

[Text] Dr. Barrie G. James, vice president of "Biogen SA," Geneva, one of the leading European biotechnology enterprises, assumes that the first pharmaceuticals, made according to new biotechnological methods, will be placed on the market in a few years. The first products synthesized according to DNA techniques (genetic engineering) will be pharmaceuticals already on the market although they will be obtained from new preliminary products and the yield will be greater; here we might mention antibiotics, enzymes, steroids, and vitamins (timing: roughly in about 2 years).

Within 4-6 years we might then have medications on the market which James describes as "analogons" to existing products but which can be produced more cheaply, with better quality, and less side effects, such as human insulin, blood factors, human albumin, human growth hormones, interferons, hepatitis-B vaccine, urokinase. James, who reported to the "Pharma 82" conference held in Geneva, did however admit that the insulin on the market would certainly not disappear; it could certainly still retain a market share of about 50 percent for a long time.

According to James, the first biotechnologically produced "absolute novelties" are supposed to come out after about 8 years and they would include the following: malaria vaccines, beta-Endorphines, gamma-Interferon, and thymosin.

The long-term program of the genetic technologists furthermore include neuropeptides, immunotropics, behavior-influencing substances, and finally specifically target-oriented gene therapy.

5058
CSO: 3698/19

DIRECTORATE HEAD INTERVIEWED ON FRANCE'S ELECTRONICS PROGRAM

Paris ZERO UN INFORMATIQUE MENSUEL in French Oct 82 pp 100-103

[Interview with Jean-Claude Hirel, director of DIELI, by Jean-Marc Chabanas]

[Text] The action program for the electronics branch, presented by the government during the summer of 1982, is particularly ambitious. In five years, France must acquire a technologic mastery of the branch, recover a balance of trade surplus, triple the annual growth rate, create 80,000 additional jobs, train 7000 more engineers and advanced technicians per year than it does at present, conduct national research projects, and so on. The director of the Directorate of the Electronics and Data Processing Industry (DIELI), Jean-Claude Hirel, discussed with 01 MENSUEL the major aspects of this exceptional action program.

[Question] What are the major features of the action program defined by the government?

[Answer] There can be no true industrial policy if we have not first defined an utilization policy, and if the whole is not supported by a research policy. The action program therefore has two balanced aspects: a utilization policy and a policy of industrial research and development. Seven topics have been defined for the first of these: some are sectorial and address themselves to industrial users, business users, as well as the administration and the national public sector; the others are horizontal, and concern training, employment and labor, information and communication, as well as the impact of information technologies.

Each of these topics has led to the definition of specific actions. In the administration and the public sector for instance, we propose to redefine current regulation procedures in data processing and office automation equipment.

[Question] Should we therefore expect an even stronger encouragement to "buy French" than we have experienced during the past 15 years, an encouragement which we know has not always been welcomed by users?

[Answer] On the contrary, we want to establish a climate of trust with users. Each enterprise in the public sector will establish a master plan--and they are all still far from having drawn one--which will be translated into quantitative terms and will make it possible to achieve contractual obligations for equipment.

[Question] How is this utilization policy translated into industrial policy terms?

[Answer] We have defined 11 sectors: components; consumer electronics; professional, civilian, and military electronics; data processing; office automation; medical electronics; scientific instrumentation; data processing, software, and data bank services; space; telecommunications; automation and industrial data processing.

In each of these sectors we have examined the situation very closely. In general, all of it represented a turnover of 96 billion francs in 1981, with a balance of trade deficit of 6 billion.

What concerns us, is that at the present growth rate of about 3 percent per year, the branch can only backslide. Without specific action, the deficit would triple by 1986: we would suffer job losses in a domain which is developping more rapidly than the gross national product, and which is therefore one of the only ones in which we could hope for an increase in employment.

This is an extremely disturbing situation, not only for this industry, but also for the economy as a whole. Can we for instance develop the automobile industry without mastering electronic ignition?

After having defined the principle of interdependence among the 11 sectors of the branch, the action program has consisted in determining the potential, trends, and reasonable objectives of each of them.

This having been done, specific industrial projects were established in each sector with the manufacturers and services involved. These projects were accompanied by a proposal for reinforcement and reorientation of industrial resources whenever necessary.

[Question] What means do you have available to fulfill these goals?

[Answer] This is where the public sector fully plays its coordinating role. Very soon, the nationalized enterprises will propose their own enterprise plans as part of the overall strategy that we have defined.

These enterprise plans will describe the strategies to be used for the selected objectives, proposed structure modifications, annual budget drafts, and associated financing requirements.

These plans, which will be established under the responsibility of the enterprises' administrations, will be the subject of extensive internal discussions--both technical and social--with their social partners.

A plan contract between the government and each enterprise, formulated on the basis of the enterprise plan, will define the means contributed by each party to achieve the defined goals.

[Question] Will the encouragement also extend to private enterprises?

[Answer] For the private enterprises, agreements will be proposed which will make it possible to involve these enterprises in the national effort, and which will subordinate the granting of state financial support to obligations in research, investment, and stockholder financial contributions.

[Question] Do these projects leave room for some competition among French enterprises?

[Answer] As I have already indicated, we want to optimize the utilization of public resources.

Whether it involves nationalized groups (Thomson, CII-HB, CGE, Matra), private groups, or PMI (small and medium sized industries), French industry will have to concentrate its forces. The government will use the weight of the nationalized sector (49 percent of the branch) to develop the strategic sectors. The strategies of the nationalized groups will have to be concerted in each sector so as to take into account the need to concentrate these investments as much as possible on one or two groups.

For the sectors in which competition can occur among industrial groups, the state aid will be based on criteria of competence and appropriatness to the overall strategy, avoiding face to face competition among companies. However, we will aim at a consonance, in concert with the enterprises.

At the other extreme, the PMI sector as a whole must constitute an essential resource for innovation, both in research and technology. The state must encourage this aspect, both structurally and financially. The role of subcontractor to large enterprises must be as profitable as possible for the PMI sector.

[Question] What are the major lines of action anticipated in the sectors most closely related to data processing?

[Answer] The objective in data processing itself is clearly to restore a balance in utilization. For this, we want in particular to first see a preparation of structures and a continued effort toward internal organization, aimed at restoring competitiveness and service quality. With CII-HB and our research potential, we believe that we hold a very good hand.

More particularly, we will consolidate the line of intermediate (management) systems, which corresponds to a large slice of the European market and to a steady investment on the part of CII-HB for several years. A very special effort will be made to offer possibilities for interconnecting heterogeneous equipment, starting with CII-HB's DSA network architecture, which will be maintained and expanded.

In mini-data processing and distributed data processing, we will strive to avoid duplicating research and development expenses, as well as the scattering of industrial and commercial investment efforts. This sector will benefit from voluntary efforts within the framework of the national project for industrial research and development in elementary modules for mini- and microcomputers.

In the field of micro-data processing, a large effort will be devoted to mass production while encouraging individual innovation.

[Question] How about components?

[Answer] Again, in integrated circuits, the scattering of resources does not appear to be the best guarantee for success, and a regrouping of industrial centers together with a reinforced effort in research and development, should make it possible to achieve a leading position in Europe, and to progressively obtain technologic independence from the United States.

In discrete circuits, the efforts will be concentrated in areas of growth and advanced technology.

In passive circuits, we will seek to limit losses in the coverage of our market through the exploitation of some specific slots and through licensing agreements.

[Question] At what stage are the office automation projects?

[Answer] At a consolidation of existing strengths: private telephones, electronic mail, which together with the willingness to invest in mini-data processing, should allow the French industry to establish its position on this rapidly growing market, and leave it free to fill its gaps, particularly in reprographics, electronic typewriters, and printers, while taking advantage of notable technologic changes.

The development of new products (text processing, electronic filing, networks, and so on) will ease this penetration.

[Question] How about the other fields associated with data processing, such as the service industry?

[Answer] France's position in software and services is considered to be good. Nevertheless, there are plans to improve it by reinforcing the industrial nature of production, by investments in programs. and by a strong development of data banks.

Lastly, industrial data processing and automation will benefit from a stimulated demand, as part of a program called "productics," which will reinforce the action of data processing engineering companies.

[Question] But will we really have the means necessary for such a policy?

[Answer] The investment program has been estimated at an overall figure of 140 billion francs in five years, derived both from the government and enterprises. Details have not yet been specific. These are figures that are clearly different from those usually announced for data processing, and the difference should not surprise us.

As an example, the three areas in which France has succeeded in establishing a competitive industry, are professional electronics, space, and telecommunications. Why? Because three elements were defined without ambiguity: precise objectives, large financial resources, and an evaluation structure.

This is all we want now. This is not a matter of playing the role of sponsor, nor that of a lender expecting more or less to be reimbursed depending on a hypothetical success. On the contrary. Several measures will be implemented when the state will finance and launch specific projects, and will receive the results in proper order. All these measures will be included in the enterprise plans approved for companies in the private sector.

Thus supported for the development of competitive products, French industrialists will be placed in a good position to withstand international competition. They will then have to trust to their own dynamism.

11,023
CSO: 3698/9

CIT-ALCATEL DEVELOPS NEW IC PACKAGING TECHNIQUE

Paris ELECTRONIQUE ACTUALITES in French 10 Sep 82 pp 1, 15

[Article by J. P. Della Mussia]

[Text] CIT-Alcatel has just introduced a new type of packaging for complex integrated circuit (IC) chips, which falls between the TAB and the chip-carrier in terms of price/performance ratio. This package requires only a leadframe to support the chip and the leads, and a drop of epoxy to protect the assembly.

Preliminary life tests carried out over more than six months have been entirely satisfactory; environmental tests will be completed at the end of 1982. But CIT-Alcatel is already accepting orders for custom hybrid circuits that use these packages for the IC's, and their mass production could start at the beginning of 1983.

Four Concurrent Packages

Four major types of IC packages are currently competing for miniaturized circuits: the flip-chip, the TAB, the chip-carrier, and the miniature DIP. The TAB package is justifiable only for runs of at least two million parts, except in the case of specific technical requirements (very fast circuits). The flip-chip requires the use of special chips, with adapted contacts (but the outputs of these chips do not need to be peripheral, which is a primordial advantage for complex circuits; this technology therefore remains ideal for large IC users such as IBM).

The chip-carrier is very expensive in ceramic (35 francs with 68 leads, without lid, in small quantities) and still relatively costly in plastic. Moreover, it becomes very large (2" x 2" for 150 leads) as soon as the number of leads increases; it is therefore desirable in practice to attach several chips per package.

Lastly, the miniature DIP (or SO package) is an interesting compromise, but its number of pins is actually limited to 16, and no manufacturer expects to exceed 24 pins in the future.

These considerations have led CIT-Alcatel to design its own package for circuits with more than 24 pins, a package that is less expensive and smaller than the chip-carrier, and which presently still remains the most attractive for small batches. The new package thus has the same advantages as the chip-carrier in terms of testing and fabrication (automatic cabling) by a customer with standard chips. But it additionally offers the advantage of higher density, greater economy, and independence from substrates manufactured abroad.

Very Simple Fabrication

The CIT-Alcatel packages start with a square metal grid composed of four rows of four leadframes (also square-shaped), designed to receive the IC chips; this grid is placed on an array of 16 small plastic squares, each facing a leadframe and a lower surface of the latter. The chips are then bonded to the center of each frame, and the chip is welded to the fingers of the leadframe.

A drop of epoxy is next deposited on each chip, and allowed to spread on the area defined by the plastic squares located under the grid. As a result, only the tips of the leadframe fingers connected to the grid's armature emerge from the drop of epoxy. Following this, all the leadframe fingers are cut at their outer extremity, except two, which are left for mechanical support of the assembly. Lastly, the assembly is tested and marked before (or after) the final cutting.

In particular, CIT-Alcatel transfers these circuits, as in the case of miniature DIP's, on ceramic substrates that the company is attempting to standardize at 2" x 2" or 2" x 1" (these substrates can also accept a heat sink on the back of the interconnection surface).

Automatable Fabrication

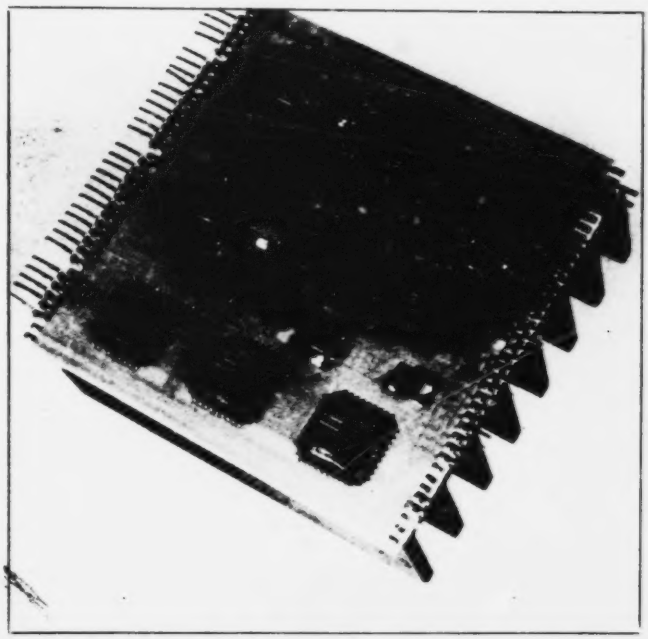
Compared to the TAB, the CIT-Alcatel package has the advantage of using a very inexpensive leadframe, which can be supplied in 15 days by many subcontractors. Moreover, all the circuit fabrication can be automated, whether for attachment or welding. (However, existing loading machines must be modified). If the chip supplier changes his circuit, a modification of the welding machine program is all that is needed to maintain production automation.

The pin-to-pin distance is only 0.75 mm, which makes it possible to manufacture circuits with 24 to 100 pins. (This distance is to be compared to the 1.77 mm of the chip-carrier, or the 2.54 mm of the conventional DIP).

Finally, the TAB remains the most interesting package only for very large productions of all the families of circuits in use (in general, 90 circuits out of 100 are requested in runs much smaller than the rest), and for extreme miniaturizations.

The cost of the package is definitely lower than that of a chip-carrier since it avoids the purchase of a package, the installation of a lid, and a verification of hermeticity. With the CIT-Alcatel process, the epoxy drop is placed automatically.

CIT-Alcatel has already manufactured with this technology, a prototype card for the E10, that combines 60 gate arrays on eight hybrid circuits. The company is at the same time working on a related technology which could lead to dimensions identical to those of the TAB.



11,023
CSO: 3102/454

RENEWED INTEREST IN MAGNETIC BUBBLE MEMORIES

Paris ELECTRONIQUE ACTUALITES in French 17 Sep 82 p 9

[Article by F. Grosvalet: "Bubble Memories: Renewed Confidence"]

[Text] When it came to MBM's [magnetic bubble memories], SICOB 81 [Exposition of Office and Business Supply Industries and Office Organization - 1981] was marked, on the part of users, by a lack of real confidence in them, and on the part of manufacturers, by a lack of long-term prospects, for the most part. Today, the situation appears less cloudy.

All those who were present in the marketplace in September 1981 are still there today, and clients now have more confidence in the product; the big potential users have reviewed their positions and seem prepared to bring out products based on MBM's.

Certain of the stumbling blocks we reported at the time of the April Components Show (see ELECTRONIQUE ACTUALITES of 9 April 1982) are beginning to disappear, thanks especially to a second-source agreement between Intel and Motorola (see ELECTRONIQUE ACTUALITES of 25 June 1982). The MITEL [expansion unknown] episode (ELECTRONIQUE ACTUALITES of 30 October 1982) contributed nothing whatever to the credibility aspect; the agreement with Intel was mainly of interest to the Canadian firm, which lost no time in breaking it as soon as it felt no further need for it, Motorola having provided it the second source of supply it sought, without its having to commit itself to costly production equipment. And the 4-Mbit memories--a capacity at which the MBM becomes highly attractive for a number of applications--will not now be long in making their appearance. Intel plans to bring its version out in sample quantities in November or December this year and to be in volume production in 1983, and Fujitsu is to introduce one by the end of next year. The Japanese one, which will be longer in making its entry into the market, will probably use a new technology, that of nonimplanted disks, which is suitable only for 16 Mbits and on which, as far as we know, only four laboratories throughout the world are working (IBM, Bell Labs, Fujitsu and LETI [Electronics and Data Processing Technology Laboratory, Grenoble]).

Today, although there is still a certain lag in the data processing market for MBM's, the industrial and professional ones appear to have gotten well off the ground. For Intel itself, MBM's are beginning to no longer be a technical novelty; they are becoming standard items in current use, for which applications are becoming more and more numerous. As their prices continue to drop, more and more markets are opening up for them. They have progressed from the harsh-environment sector (military, space, shop automation) to that of telecommunications (private automatic exchanges) and portable applications (terminals, data loggers, personal computers); and now, the office and business systems market is about to open (point of sale and banking terminals, electronic typewriters).

A Second-Source Agreement Soon for SAGEM

On the French side, SAGEM [Company for General Applications of Electricity and Mechanics] has still not chosen among the remaining four manufacturers; talks are under way and an agreement is thought to be imminent, but it is not known as yet when or with whom. The other four are not being any more loquacious; Intel still looks forward to further second-source agreements, and so does Fujitsu, but neither one will comment!

The French company is pursuing its military and space program, which is now well along, in that, it will shortly deliver to the ESA [European Space Agency] a space recorder with a capacity that could be as high as 256 Mbits (It has already furnished to the military the prototype of a fast auxiliary memory with a capacity of around 100Mbits). SAGEM, at its Eragny plant, is continuing with the industrialization phase of 256-Kbit chips using permalloy technology and has actualized all the necessary peripheral electronics for this type of components, but only for the professional market. Its entry into civilian applications, particularly the bringing out of a 1-Mbit unit, will depend a great deal on the second-source agreement it expects to strike, as well as on the future of an MBM "plan" to be financed in part by the government (see ELECTRONIQUE ACTUALITES of 12 and 19 march 1982).

Tecnologies of the Future

In addition, SAGEM is continuing its technological cooperation with LETI on future generations of MBM's. The laboratory is doing work in two fields: The production of 256-Kbit chips by the wafer stepping photoreduction process, and a feasibility study on memories using DNI [nonimplanted disk] technology in the 8-micron range. It is also carrying out exploratory studies on thin-film conductors involving the development of new garnets. The latter technology, which obviates the need for rotary field coils, should enable the attainment, with new materials, of bit rates around 2 Mbits/sec. (800 Kbits/sec with present garnets).

The DNI technology, in which nickel-iron components are replaced by zones in which the anisotropy is locally embedded superficially in the epitaxy film (this is done by means of multiple ionic implantations), still needs

a rotating field produced by coils, which limits the data bit rate to some hundreds of Kbits/sec. The advantages of this technology, however (easier photolithographic operations, entirely planar technology, minimum required dimension of 1.5 to 2 times the diameter of the bubbles versus 0.7 in the permalloy technology, and smaller rotary field amplitudes needed), should enable the production of very-low-cost mass memory MBM's for microprocessors and minicomputers.

9238
CSO: 3698/8

ELECTRONICS

DISMANTLING OF AEG-TELEFUNKEN UNDER WAY

Paris ELECTRONIQUE ACTUALITES in French 3 Sep 82 p 3

[Unsigned article]

[Text] Placed under court order on 9 August, the AEG-Telefunken group is awaiting the verdict of the report submitted by the government's investigation commission. The analysis and recommendations of this report will determine the outcome. Even though the government refuses to participate in the rescue, it nevertheless is extending its guarantee for 600 million marks of credit intended for exportation. In turn, the banks have granted a credit of 1.1 billion DM to solve some immediate problems. The dismantling seems to be inevitable, and many discussions have been held with possible partners; Grundig appears to be a serious candidate. Licensing will be necessary under any circumstances.

Just like two years ago, AEG-Telefunken is in a critical situation. The placement under court order on 9 August provides it with a short respite. Some sectors, particularly the investment goods and the technical equipment, are not affected and continue to operate normally. AEG-Kanis will be ready to deliver the first two turbines for the gas pipeline. The court order reimburses 40 percent of the debts to creditors, except those smaller than 10,000 DM, which are fully covered. The measures taken by the supervisory council will determine the future of the group; many factors, among which are credit and employment, will depend on these measures.

Call for Credits

In the name of market economics, the German government takes only a remote interest in the problems of the group. It does however secure the credits of 600 million DM intended for exportation (a subsidiary is to be created for this purpose), which the European commission has endorsed. And it also exerts pressure on the banks to obtain credits for settling current affairs. At present, 1.1 billion DM are released by the consortium of 24 banks which controls the group. Laender is also helping, but in a non-systematic way. The two subsidiaries, Neff and Zanker, specializing in household appliances (and currently under court order), are using a credit of 10 million DM extended by the Bade-Wurtenberg government.

The Partners

In the long range, it is not credits that need to be obtained, but new partners for all or part of the activities. Many companies are already in line for this dismantling. While Thomson-Brandt and General Electric seem to have pulled back to await developments, Grundig is negotiating its participation with Telefunken for recreational electronics; Telefunken should then end the agreement it has with JVC for videotape recorders. Otherwise it could manufacture both JVC's VHS, and Grundig's Video 2000, and would be in a dominant position on the market, a situation which the federal office for cartel control wants to prevent. Bosch and ITT could be additional partners in Germany for this sector. In turn, United Technologies would be interested in a cooperation in the semiconductor and equipment field. Electrolux would buy two subsidiaries, Zanker and Neffwerke, both of which specialize in household appliances.

The Price to Pay

In addition to dismantling, the group cannot make it without licensing. It is estimated that a minimum of 23,000 jobs will have to be eliminated. Indirectly, even though AEG is honoring its contracts, the fact that each new contract is subordinated to financial guarantees from banks, slows down orders and reopens the question of the existence of some subcontractors, especially if they do not recover their funds. The employment cost could be heavy for Germany.

In any case, the solution being sought shunts out possible Japanese buyers so that they will not increase their pressure in Europe, and falls within the context of a European movement.

11,023
CSO: 3102/453

INMOS SAMPLES 64K DYNAMIC RAM CHIP WITH 100NS ACCESS TIME

Paris ELECTRONIQUE ACTUALITES in French 10 Sep 82 p 16

[Article by F. Grosvalet]

[Text] Nearly one year behind schedule (see our 17 April 1981 issue), INMOS has begun sampling a very fast 64K dynamic RAM; it is available in two versions with access times lower than 150 ns: IMS 2600-10 (100 ns access time), and IMS 2600-12 (120 ns) (the fastest current 64K DRAM's offer 150 ns access times). These memories are available in France in small quantities (10 to 20) at Tekelec Airtronic, which represents the English company in our country. They will at first be produced in the United States, and then in Newport (Great Britain), which is expected to become the company's largest production center.

Despite its late arrival on an already saturated market (some 17 manufacturers of this type of memory were counted in April), INMOS hopes to sell several thousand 64K DRAM's during this year, and several millions in 1983. This may seem ambitious in view of their prices: 28 dollars per hundred for the 2600-10, and 20 dollars for the 120 ns. However, these are sampling prices and are consequently expected to drop very rapidly. They should even be halved by the end of the year, which would put the IMS 2600-10 at 14 dollars at that time (which will still be twice the current official average price of a 150 ns device). It thus remains to be seen whether the very specific users of this type of memory will be ready to pay for the speed.

But the English company has the advantage of being the first on the market (mass memories for high performance computers, graphic displays), a market which it estimates at 5 percent of the total market for 64K dynamic RAM's in 1983.

In addition, INMOS is preparing two other 64K DRAM's: a 16K x 4 with pinning identical to that of TI, the IMS 2620, which should be sampled at the end of the year; and an 8K x 8 for the beginning of 1983, for which it forecasts a market of 3 million units next year and 22 million units in 1984.

We should point out that the INMOS memory differs by two characteristics which lend it its speed: operation in the nibble mode, and on-chip refreshing through CAS-before-RAS.

Nibble Mode

The nibble mode invented by INMOS is now generally recognized by computer manufacturers as a requirement for 256K dynamic RAM's, which allows the user to access four bits of data, in write or read mode, from a single 16-bit address, thus reducing the access time. The second characteristic, which the English company calls CAS-before-RAS, allows on-chip refreshing in 256 cycles every 4 ms, each time the CAS signal precedes the RAS signal, while leaving pin 1 unconnected, a feature which is very important for future 256K compatibility.

We might remember that this memory is fabricated with NMOS technology, 2.7 micron lines, and two levels of polycrystal silicon; it includes two groups of four rows and two redundant columns, and measures 22.5 square-mm. The IMS 2600-10 and 2600-12 have cycle times of 160 and 190 ns respectively, and maximum consumptions of 468 and 413 mW at 5 V, as well as 22 mW on stand-by.

Lastly, they are available in ceramic 16-pin DIP packages, and should soon also be available in plastic 16-pin DIP and 18-pin chip-carrier packages.

11,023
CSO: 3102/453

ENERGY

WORK BEGINS ON EUROPE'S LARGEST PHOTOVOLTAIC POWER PLANT

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 22 Sep 82 p 5

[Text] Frankfurt, 21 September. Work has been begun on the North Sea island of Pellworm on the construction of Europe's biggest solar power plant. Starting July 1983, the sun is to provide current for the spa center and the surrounding houses. On an area of about 16,000 m^2--corresponding to about two soccer fields--the New Technologies Sector, Space Travel, of AEG [General Electric Company]-Telefunken, is building the 300-kw solar generator which correctly converts sunlight into electric energy.

To be able to continue the agricultural use of the pasture land on the island, the solar generators are being set up on frames with a height of at least 1 m. In this way, the sheep can graze unhindered in the fields. The project, presumably involving DM11 million, is being decisively financed by the Research Ministry and the EC. The facility is also intended simultaneously to gather technical data during the testing phase; these data are necessary for the planning of future solar power plants into the Mw range. Questions of economy and operation here are essential criteria. In the past, experiences have been gathered with solar plants most in the countries of the Third World.

The spa center is a customer for solar energy because it has its highest energy requirements during the summer. A battery storage unit is supposed to supply the current during the night and during bad-weather periods. Because more energy is available than would be needed by the spa center, surplus energy can be supplied to the power supply grid of Schleswag. Today, a kilowatt-hour of "solar current" still costs about DM2. The solar researchers of AEG, who are based at Wedel near Hamburg, however are confident that they can reduce the price to DM 0.30 through transition to large-series production between 1986 and 1988.

The EC is supporting the development of photovoltaic energy sources in a total of 16 projects. One of the objectives of these development efforts in Western industrial nations--in addition to securing the energy supply and providing help for the Third World--is also the opening up of an export potential. The order of magnitude of the German market emerges from a study by the Federal Association of Solar Energy, Incorporated, published in 1982. Assuming a share

of regenerative primary energy sources of 2 percent out of the world's primary energy consumption is 2000, a German market share of more than DM6 billon annually would be possible in the light of present-day prices.

5058
CSO: 3698/19

ENERGY

NETHERLANDS PROCEEDS CAUTIOUSLY WITH WIND ENERGY PROGRAM

Paris AFP SCIENCES in French 8 Jul 82 p 28

[Text] The Hague--The Netherlands government has decided to proceed--cautiously, for the time being--with its wind energy support program, by providing backing for the construction of an experimental array of 10 to 20 wind engines, each developing 0.3 to 0.5 megawatts. This decision was announced on 7 July by the Council of Ministers, which, however, postponed until later the implementation of a more ambitious project.

This project, which goes under the name of its inventor, engineer Lievense, would consist of building a wind-engine capacity of 800 megawatts which would feed a reservoir lake 30 meters above sea level. A bleed-off from the lake would drive conventional hydroelectric turbines to smooth out the irregularities of the wind.

Before undertaking a work of such titanic scale, the government has preferred to await the results of its experimental program to asses the economic viability of using the wind and to induce Dutch industry to explore this sector more in depth.

In the report on which the government has based its decision, the experts state that considering the small capacity of the experimental project, the electrical network can absorb the output of the wind engines without the need of providing a reserve energy buffer system.

The experts have calculated that wind energy can become economically viable if the prices of the other energies continue rising and if, on the other hand, the cost of the wind turbines, with their accessories, can be kept down below 2,500 florins (6,250 francs) per installed kilowatt.

The project is to be financed half by the government and half by the electricity producing enterprises.

Paradoxically, the country of the windmills has been very hesitant about using wind energy, particularly in view of the availability of natural gas

reserves, which represent greater revenues for the government. The few windmills operating experimentally in the country are for the most part of Danish origin, and their owners are constantly coming up against niggly obstructionism on the part of the authorities responsible for urbanism and land use.

9238
CSO: 3698/8

FRANCE'S INDUSTRIAL STRATEGY TAKES SHAPE

Paris SCIENCES ET AVENIR in French Sep 82 pp 12-13

[Article: "'Productics,' Weapon for an Economic War"]

[Text] "Productics," the daughter of robotics and mechanics, is the new discipline born of the two reports by Petiteau (robotics) and Persuy (mechanics). According to the Minister of Research and Industry who coined this neologism, this should be considered as "the new indispensable weapon in the state of economic war in which we find ourselves."

Indeed, we have a great need for it in the light of these two reports submitted at the end of July to Jean-Pierre Chevenement. As far as robotics is concerned, France is perhaps not lagging from the scientific point of view, but industrially, she ranks fifth in the world with an investment of 190 million francs in 1981 behind Japan, the United States, Sweden and Italy. However, the ambition shown is for France to become the world leader by 1990.

For the time being, the automobile industry alone, and of course Renault, the number one French manufacturer (30 million francs and 60 robots in 1981), has truly integrated the robotics phenomenon. The mission, therefore, proposes the creation of an interministerial committee on robotics, the support of the ARA (advanced automation and robotics) program launched over two years ago as well as of pilot operations, for example, the creation of plants capable of processing different products. Priority is given to the training of 2,400 persons (1,200 automation specialists, 1,000 teachers and industrial workers, 100 specialists and 100 "generalists") and to the hiring of 410 research workers. The budget anticipated has been evaluated at 2.4 billion francs over a three year period.

Mr Jean Persuy's report on mechanics also brings to the forefront the French weaknesses without, however, considering that industry, which is essential in the national economy, as a disaster. It exports 50 percent of its production, employs over a million people, ranks fifth in the world; this is the situation. But, as noted in the report, the overall effort devoted to that industry is three times smaller than, for example, in Germany. It is therefore time to react by setting up training programs and increasing the general technical level, essentially of the small and medium size firms. It

would be useful to base development work on only a few pilot firms but all the firms should participate in this undertaking.

Finally, an important remark should be noted, which has already been emphasized in the two-year old report prepared by the Academy of Sciences on "the Mechanical Sciences," namely that mechanics has strategic aspects which a nation such as France cannot afford to neglect.

9286
CSO: 3102/447

PROGRAM OF GOVERNMENTAL ACTION IN ROBOTICS, AUTOMATION

Paris ZERO UN INFORMATIQUE MENSUEL in French Oct 82 p 58

[Text] In order to overcome the present handicaps and turn around an alarming situation, a program of governmental action in robotics and automation is about to be made public. This program is based closely on the work of the Petiteau mission, and contains the following nine points:

1. The establishment of a CIR [Interministerial Committee on Robotics], through the expansion of the CODIS [Committee for the Development of Strategic Industries]-Robotics group. This committee will act to orient governmental actions and coordinate the policies of the various ministries and departments, and the funding allocated. It should have a budget for 3 years (83/84/85) of 2.4 billion francs, distributed as follows: 235 million for equipment; 1.94 billion for specific coordinated actions; and 225 million for subsidies.

2. The establishment and/or strengthening of specialized areas of competence. The Besancon area is under study to handle light robotics and peripheral robotics. There an automated production institute, to be set up, will be responsible for the qualification of components. The Toulouse area, called "Midi-Robots," based on an industry-laboratory association, will handle the preliminary development of robotic products with a strong computer and software component. The resources planned: 75 million a year. Other units are also planned, in the Paris region, in Nancy, Strasbourg, Aix-Marseille, Tarbes, and Nantes.

3. The start of the following major research programs: ARA [Advanced Automation and Robotics], to be expanded to include artificial intelligence (80 million over 3 years); a new "components" program (150 million over 3 years); economic and social sciences; employment (5 million over 3 years); continuous process automation (20 million); relations with other disciplines

(45 million). For developmental aid (ANVAR [National Agency for the Valorisation of Research], ADI [Data Processing Agency], etc.) the resources allocated are 1.4 billion over a 3-year period.

4. The conducting of pilot operations in flexible assembly workshops in manufacturing industries. The proposed budget: 258 million over 3 years.

5. The preparation of an integrated robotics training system, to be given through the present educational structures: 30 million over 3 years.

6. Information on and promotion of new techniques by the AFRI [French Industrial Robotics Association] and learned societies: AFCET, ISF, and SEE [expansions unknown]. Some of the activities planned: the formation of a computerized reference system, the founding of a journal, and conducting of exhibits. Cost: 20 million over 3 years.

7. Qualification of components of robots and peripheral equipment, the establishment of quality and standards. Cost: 60 million over 3 years.

8. The structuring and organization of industries, of SSCR [Robotics Services and Consulting Companies], aid for the establishment of robotics companies, the organization of information systems for distributors: 120 million over 3 years.

9. The establishment of a procedure for financing equipment by extending the MECA [Advanced Design Machines and Equipment] (ADEPA [Agency for the Development of Automated Production]), and aid from the ADI.

According to Maurice Petiteau, we must create "a new way of thinking and working."

Along with Mr Petiteau, we hope that these measures he is advocating may be a decisive factor for change in our industry.

7679
CSO: 3698/15

ASEA DEVELOPS LARGE WELDING ROBOT FOR AUTO INDUSTRY

Stockholm NY TEKNIK in Swedish 8 Jul 82 p 2

/Article by Jan Segerfeldt: "Large Welding Robot for Auto Industry"/

/Text/ Vasteras--Asea's robot family has received a new member. The newborn is the biggest one so far; it can lift 90 kilograms. Automobile factories all over the world will become its place of work.

Asea will now market a new robot, which specializes in spot welding. It was developed primarily for the needs of the auto industry. The new robot features a 50 percent greater reach and a 50 percent greater lifting capacity. This means that it can lift 90 kilograms and can reach nearly 4 meters with its arm.

One out of every five robots sold by Asea works with spot welding. Gluing, arc welding, polishing, burring and cleaning of castings are other tasks. Many robots are also used to service groups of machine tools.

"We have 30 percent of the European robot market," says Bjorn Weichbrodt, head of the robot division.

In the United States, the automobile nation, the company occupies third or fourth place. Asea hopes to take yet another step forward with the new spot welding robot and a new assembly plant near the auto city of Detroit.

Even before marketing of the new robot had begun several had been sold, but only in the Swedish market. It is Saab in Trollhattan which ordered 60 robots, a considerable number of which are the new spot-welding robots.

As NY TEKNIK wrote in issue 1982:5, the other Swedish automobile manufacturer, Volvo, chose Cincinnati robots for its production of the 760 series. It is possible that the decision would have looked different had Asea's new robot been completed earlier.

The reach is particularly important for auto manufacturing. The new Asea robot can reach nearly 4 meters, compared with 2.5 meters for the 100 Cincinnati robots at Volvo.

The safety functions have been improved with the introduction of this robot. (A Japanese robot killed an operator earlier this year.)

Some examples:

--During programming, when the operator needs to work close to the robot, the speed of movement of the robot cannot exceed 25 percent of maximum.

--The control lever of the hand-held control unit has a "deadman feature." A panel must be depressed at the same time as the control lever is moved This will prevent unintentional movement by the robot, if the control lever should be reached by mistake.

11949
CSO: 3698/2

BRIEFS

COMPOSITE MATERIALS--The CODEMAC [Committee for the Development of Composite Materials] and Bordeaux Air and Space are organizing a mission to Japan to attend the ICCLIV [4th International Conference on Composite Materials] to be held in Tokyo from 25 to 28 October of this year. This mission is to present the actions taken in France for the development of composite materials, and make contact with the major industries in this field. A full schedule of activities is planned for this occasion. In addition, this program will permit the delegates to take part in the International Symposium on Carbon, to be held in Toyohashi from 1 to 4 November 1982. A delegation including representatives of the major university laboratories and air and space firms in the region is to take part in this mission. [Text] [Paris INFORMATIONS CHIMIE in French Jun/Jul 82 p 67] 7679

CSO: 3698/15

END

JPRS 82218

12 November 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 126

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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JPRS 82218

12 November 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

No. 126

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COMPANY FORMED TO PRODUCE, MARKET COAL-WATER FUEL IN SWEDEN

Stockholm SVENSKA DAGBLADET in Swedish 1 Oct 82 p 27

[Article by Annabell Dahlberg: "Sonesson's New Energy Company"]

> [Text] Energy costs can be reduced by 15-20 percent with the new coal-water fuel fluid carbon, an alternative to oil which will now be launched in Sweden and on the world market.

Volvo-owned Sonesson has 51 percent of the newly established Fluidcarbon AB. Professor Bjorn Lindman and civil engineer Lars Stigsson have developed the coal-water fuel fluid carbon in parallel with a special type of burner. The Swedish firm will be both a production and a marketing company. The managing director will be Conny Johansson and the president will be Anders Wall.

Rebuild

"Fluid carbon is going to be integrated into the infrastructure of oil," said the managing director of Sonesson, Hans-Eric Ovin. "Conventional burners can be converted, and means of transport are comparable with those for oil. According to our calculations energy costs could be 15-20 percent lower than with oil, despite conversion costs, over a period of 8 years."

In the new Swedish company, which will have a stock capital of 50 million kronor, the chemical company Kema Nobel is going in with 9.5 percent, the Malmo company Electro Sandberg with 5 percent, the American chemical company Allis-Chalmers with 9.5 percent, and the inventors themselves with their own company Fluid Carbon International with 25 percent. The fluid carbon process has been tested in Malmo, and with the present production facility at Malmo harbor 30,000 tons per year can be produced. On the customer side, Lund power plant and Volvo's Olofstrom plant have arranged for continuous operation.

"We will get started soon," said Hans-Eric Ovin. "We are aiming for a production of 500,000 tons next year. That corresponds to 250,000 tons of oil. But then we must have a larger facility than we now have in south Sweden."

9287
CSO: 3698/32

BRIEFS

SOLAR CENTER--Federal Research Minister Andreas von Bulow laid the cornerstone for the new AEG-Telefunken solar center in Wedel/Holstein on 2 July. By mid-1983 a 6000 m^2 pilot production plant for solar generators and for a special solar research laboratory will be constructed there with BMFT funding. The costs for solar generators should be reduced and new applications explored for photovoltaic energy conversion systems by this facility using series production with simplified process and manufacturing methods. The erection of the solar center would also promote the goal, as stressed by von Bulow, of cooperation with countries where the use of solar energy is particularly promising, through training of international partners in the area of solar engineering. By means of solar engineering, not only can there be a contribution to an improved energy supply at home and in third-world countries, but international exchange of new technical products could be enhanced. [Text] [Duesseldorf VDI NACHRICHTEN in German 16 Jul 82 p 1] 9280

COAL-WATER FUEL--An energy system that within several years could reduce Sweden's oil bill by billions now is being marketed commercially by the Malmo company Sonesson, which is owned by Volvo. Along with four part-owners, this company is forming Svenska Fluidcarbon AB, which will have an initial capital stock of 50 million kronor. Sonesson will be the majority stockholder with 51 percent of the shares. The new company has purchased the rights to the so-called fluid carbon process for the Swedish market from a company in Malmo. The process uses finely ground pure coal mixed with about one fourth water. The proper combustion and flow properties are provided by adding a mixture of three secret chemicals. Sweden now has boilers capable of producing 15,000 MW that could be converted profitably to use the "liquid coal." The newly formed company already has a production facility at Malmo harbor, but hopes to increase production tenfold at a newly constructed plant. Sonesson's executive vice-president Hans-Eric Ovin cannot say where the new plant will be. "We are considering various sites. It may be in Malmo, Trelleborg, or perhaps in Landskrona." The Lund Power Board and Volvo Olofstromsverken will be the first customers to buy the "liquid coal." "According to our calculations, our customers could reduce their energy bill by 15 to 20 percent," Hans-Eric Ovin said. He did not wish to discuss what effect the project would have on employment in southern Sweden. [Text] [Stockholm DAGENS NYHETER in Swedish 1 Oct 82 p 2] 9336

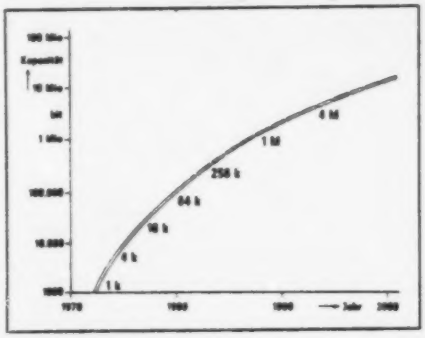
CSO: 3698/22

ELECTRONICS

SIEMENS CPU TECHNOLOGY: GREATER PACKAGING DENSITY

Wuerzburg ELEKTRONIKPRAXIS in German Jul 82 p 72

[Text] Since 1972 there has been a total of four generations of semiconductor memories each occurring every 2 to 3 years. The capacity of the memory components rose during this time by a factor of four.



Every 2 or 3 years the MOS memory capacities have quadrupled.

Siemens is using, for example in computers, the in-house developed and produced 64 Kbit chip. The next generation, the 256 Kbit memory chip is currently under development by the firm.

Time Savings Through Short Pathways

In addition of software-programmed microprocessors, the Siemens central processing units use logic components (Gate-arrays) whose particular, specific functions are established via hardware in the last production step. The Gate-array chip with 36 logic cells developed and produced by the firm using this so-called Master-Slice method, provides the highest processing speed in the series 7500 CPU. A Master-Slice-Gate-Array with 120 logic cells is already under development. Its gate transit-times will be less than 0.5 ns. The fast interplay between the memory registers and processing circuits is of great importance in the CPU. Therefore, Siemens for the first time embedded a memory field (RAM) between the logic cells in one of its newest Master-Slice-Chips. With only 3.5 ns access time, it is among the fastest semiconductor memories in the world.

This increases the danger of soft-errors, that is, wrong circuits, which occur rarely and are not reproducible. They are caused in the first place, by minimum electrical disturbances, and secondly, by Alpha-particles from the environ of the chip, and also by particles from general cosmic radiation.

Soft Errors on the Track

These effects would lead to several errors per day in the working memory. This problem is countered by two measures: The 64 Kbit MOS chips are coated with a Siemens-developed, photolithographic structurable protective polyimide layer which absorbs the alpha-radiation. But mainly the CPU operates with a "Correction-refresh" in the working memory. At regular time intervals, the content of the working memory is read automatically and without affecting the CPU, fed through an error correction device and rewritten again without error.

In the new models 7.561 and 7.571 the pipeline-principle is used at five locations. Thus, up to five commands can be handled simultaneously which corresponds approximately to a four-fold increase in performance over a serial processor operating at the same speed.

9280
CSO: 3698/24

SWEDISH COMPANY PRODUCES PLASMA ETCH EQUIPMENT

Stockholm NY TEKNIK in Swedish 12 Aug 82 pp 8-9

[Article by Sture Skold: "Englishman in Malmo Breaks U.S. Dominance--First Swedish Machine for Etching Circuits With Plasma"]

> [Text] Malmo--Steve Byars, a 24-year-old Englishman living in Malmo, is the creator who broke the dominance of the Americans. He is behind the first Swedish-built machine which etches so-called chips in silicon plates using a plasma technique. Electronic scientists and manufacturers will now be able to continue the hunt for even more compact chips with machines which are cheaper than American counterparts.

In spite of being 24 years old, he was for 4 years the production manager for Nano-Tech Limited in England. It is a business which produces chambers and entire systems in plasma technology.

Now he works at Vacutec in Malmo. That company is launching the new reactor chamber. Normally Vacutec works on cooling techniques for the food industry and on vacuum pumps.

It was a natural development for the company to also try to produce a reactor chamber for dry etching of silicon plates, and in this way to produce chips, according to Goran Wrambeck at Vacutec.

"Previously the Americans have been alone in this type of production, and could therefore charge excessive prices," said Goran Wrambeck. "Now we have begun our own production in Scandinavia and that is good for competition and good for the price structure."

Customers' Requirements

"Furthermore we can fit our production to our customers' requirements, and one need not purchase more than he requires."

The reactor chamber which is being made in Malmo is primarily for research and fabrication of IC circuits in small numbers. The apparatus can be used for training, to train processing technicians for the semiconductor industry, fabrication of semiconductor prototypes and for different industrial projects.

The first machine went to the Institute for Applied Electronics in Stockholm, and is going to be used there for lithographic research. This means to investigate how thin lines it is possible to draw on a silicon film, which is decisive for how much information can be stored in an IC circuit. Today it is common to work with lines about 2-3 um (1 um = 1/1000 of a mm), but scientists want to reduce that to under 1 um, and so a new technique is required.

Plasma technology has proved to be very appropriate here.

In plasma etching a plasma is created by passing a high voltage between two electrodes enclosed in a thinned gas. The electrons in the high voltage release gas atoms which in different ways cause the line pattern which is exposed on the silicon plate.

Pressure and Heat

Different gases produce different effects, which are also influenced by pressure and heat. And it is that which science is studying. It is also possible with the aid of the reactor to turn the process so that instead of etching lines on a silicon plate, to make a so-called plasma deposit. That means to build a mesh on the exposed surface with the aid of different gases.

"We have previously cooperated with the Microwave Institute and received the results from the reactor chamber which they have there," said Stefan Svensson at KTH [Royal Institute of Technology]. "But it is important from a training standpoint that we get another."

"Now we can test our results sooner and we can also work more independently. We can also wet etch with acids, but that does not produce such thin lines as plasma etching, since the fluids take more than is necessary."

Lund in Line

In Sweden it is Chalmers in Goteborg which leads in training in semiconductor technology, but KTH in Stockholm is also well ahead. Next in line to get its own reactor chamber is LTH [Lund Institute of Technology], but there nothing has been decided. There they also have an interest, together with a group of electronics firms, in building up an entire line for the production of chips.

Great Interest in the Reactor Chamber

Rifa, L. M. Ericsson's development company for integrated circuits, among other things, will borrow a reactor chamber from Vacutec in the fall. Asea is also interested, as is Volvo. Automobiles of the future are going to be all the more computerized, and the need for their own system with IC circuits is going to grow.

Otherwise the interest for production of own IC circuits is not so great in Sweden. The market is just too small. The great interest is in Europe.

The next reactor chamber that Vacutec is building is going to Plasma-Therm in England, a company where Steve Byars previously worked and which now has intimate cooperation with Vacutec. Beyond that, expressions of interest have been received from seven other firms in Europe.

"Since we presented our small and inexpensive reactor chamber a couple of weeks ago, everything has gone so fast that we can barely keep up," said Goran Wrambeck. "Which orders or how many we will have in 2 months I have no idea."

In the fall Vacutec will also present a larger reactor chamber for "sputtering" and thin film production with plasma techniques. The thin film prolongs the life of cutting tools such as drill steel and milling steel.

"It will go to the Technical Center at the University of Linkoping, and we will share their processing experience. Such cooperation is worth gold."

9287
CSO: 3698/32

RESEARCH MINISTRY SPONSORS PRODUCTION ENGINEERING PROGRAM

Duesseldorf VDI NACHRICHTEN in German 13 Aug 82 p 4

[Article by Ingward Bey: "Automation All Around the Machine"]

> [Text] Flexible interconnection and work piece handling are the main points in the production technology promotion program. After the actual processing procedures in cutting production in recent years were extensively made available to automation especially through increased use of NC equipment, a new development concentration point is arising all around machines: Automation of charging of and waste removal from machines also in the range of smaller and medium lot sizes.

Flexible production cells have increasingly been developed and have been displayed at technical fairs. Some of these cells were also promoted with funds from the Federal Ministry of Research and Technology (project manager: Karlsruhe Nuclear Research Center, Incorporated).

In these cells, the following functions are completely or partly automatic: Feeding, charging, inserting, clamping, processing, measuring, removal, storage; this in many cases facilitates an approach to unattended production which of course is limited in terms of time but which nevertheless is significant. This is the basis for the automated factory and what we have here are essential building blocks for the gradual introduction of new technologies.

The system boundaries, which are drawn more tightly compared to flexible production systems, give us easier utilization possibilities in smaller and medium enterprises: Investment volume, scope of technical solution to be contemplated, risk, extent of organizational adjustments--these remain clear and can be handled.

An interesting distinguishing feature of the currently known flexible production cells is the manner of automated charging of machines from a work piece storage unit.

In turning machines or rotation parts there are predominantly three possible solutions:

Charging by means of industrial robots. Many examples in this connection were displayed at the last EMO in Hanover, for example, a chuck lathe (by Diedesheim) for large work piece diameters of up to 1,200 mm with a "Unimate 2000" robot, a WS 401 NC gear shaper (by Liebherr) with handling instrument (by ZF), or an RNC 600-E horizontal turning machine (by Montforts) with loader, as hydraulic system (by Fibro). These solutions are also suitable for subsequent installation on existing machines but as a rule often entail the disadvantage that they take up additional space, that they reduce the room available for operation and attendance, and that, in terms of control technology, they contain two separate systems for processing and charging.

Charging by means of robot-like handling accessories attached to the machine; by way of example we have here the NC turning automats (by index) with the "Auto-Servant" manipulators of the WHF construction series or the "Slant-Turn 15" lathe with "Flex 1" handling instrument (by Yamazaki, Japan). These solutions are elegant, space-saving, and offer the user systems from one particular maker. For the manufacturer, this solution however represents design adaptation of the machine to the handling function.

Charging by means of integrated, universal handling instruments in the portal version: here among other things we know the MD5S lathe with portal grabber and interconnection building blocks of the MDS-Automation system (by Gildemeister) and the CNC automatic lathes with FHS flexible portal handling system (by Traub).

In the milling and drilling area or for prismatic parts, manufacturers are offering processing centers with pallet exchangers and pallet pool on the market. Examples here are the Hueller-Hille CNC processing center model nb-h 70 with work piece pallet rotary magazine for eight or more pallets and transfer station (by Hueller-Hille), the CNC milling center with pallet storage unit and work piece exchange mechanism coupled with automatic clamping (by Maho) or the MC-100 processing center (by Heidenreich & Harbeck/Makino).

The charging mechanisms described moverover as a rule offer a good beginning toward the interconnection of several machines. Of course, this problem is more difficult to solve than mass production where the various mechanisms in many cases are coordinated with a single part. Automatic interconnection will be worth the trouble only in small series when there are good possibilities for the magazine storage of parts in one particular lot. Transport from machine to machine or from cell to cell can be accomplished via a standard magazine. Past solutions pertain mostly to rotation-symmetry parts such as shafts for small motors, spiral drills, disks, disk rings, and the like. The flexible design of the magazines, of the charging and removal mechanisms, of the grabbers, etc., is a difficult task and essentially depends on the work piece spectrum which is to be moved.

The automation of charging and transport of prismatic parts is also made more difficult by the need for clamping. On the one hand, there is no universal pallet and there is no universal device building block set; on the other hand, the process of clamping is presently automatable only to a limited degree.

In this article we have been able to touch only on a few of the many problems and possible solutions connected with flexible work piece handling. There are many additional aspects here; they concern above all measurement technology and quality assurance (automatic production makes sense only if we get "good" parts), the control-engineering component (the automated solution must also be clear, maintainable, available, and controllable for the smaller enterprise), and the organization as such (new production concepts must be fitted into the plant organization or viceversa and the latter must be adapted to the new production process. If necessary, personnel must be retrained).

5058
CSO: 3698/37

IMPROVED TECHNIQUES FOR MACHINING KEVLAR DEVELOPED

Paris L'USINE NOUVELLE in French 23 Sep 82 p 128

[Article by Pierre Laperrousaz: "Knowhow and Style in Machining Kevlar"]

> [Text] Using specialized cutting tools, it is possible to prevent lint-formation and fraying of Kevlar-fiber composite materials during drilling and milling.

Now that high-performance composite materials are making a decisive breakthrough in aeronautical engineering, it may be helpful to consider certain implementation problems which, although trivial at first sight, are nevertheless an obstacle to the mass-production of these materials. One of these problems is the machining of composite materials containing Kevlar aramid fibers. These are hard to cut. As a result, the composite material will fray when conventional fabricating tools (drill bits, milling cutters, saws, etc.) are used. This is why, since DuPont de Nemours introduced this material on the market, they have collaborated with users in trying to develop better adapted tools and procedures.

The latest of these research and development programs has just been completed. It was carried out by the Fraunhofer Institute in Aix-la-Chapelle, together with DuPont de Nemours International SA (Geneva) and Messerschmitt-Boelkow-Blohm, MBB (Hamburg); the latter manufactures the Airbus 310 vertical stabilizer. The objective was to design tools and determine working parameters for the series drilling and milling of perfect holes, without lint formation or fraying of the reinforcement fibers, and without delamination on either side of the holes, in a laminated composite materials with a mixed reinforcement made of carbon-fiber and aramid fabrics.

Single-Spline Helicoidal Drill Bit

In drilling, the best results are obtained with a single-spline helicoidal drill bit developed by MBB and manufactured by Klenk (Balzhein, FRG). It differs from traditional drill bits in that its cutting edge is crescent-shaped. Systematical testing has shown that the helicoidal angle should be

Drilling

Milling

Traditional tool

Tool designed for the machining of composite materials

Bit and milling-cutter developed by MBB

Comparative Drilling and Milling Tests

(Photographs: DuPont de Nemours)

between 29 and 35°, and the rake angle between 12 and 20°. Durability is improved when special carbides are used: K 10 for fixed drilling machines, and P 25, which is harder, for hand-drills. A 5.6-mm diameter drill bit was used to drill over 1,200 holes, i.e. a total work length of 3.6 m, in a 3-mm thick laminated material. A slight blunting of the drill-bit points was observed, but the bit could still be used. The cutting speed was 150 m/min at a feed rate of 0.05 mm/revolution. Feed guiding is necessary to ensure consistent quality when a great many holes are drilled. The same principles apply when designing a milling cutter: the tool must push the fibers from the periphery toward the inside of the laminated material.

Milling Cutter With a Guiding Point and Two Cutting Edges

Tests on many bits and milling cutters resulted in the selection of a milling cutter with a guiding point and two cutting edges, providing a balanced distribution of cutting forces at a minimum cost. To minimize the cost of this tool, which is manufactured by Guehring (Albstadt, FRG), carbide cutting edges were welded to a steel matrix, the degrees of hardness being the same as for the drill bit. The characteristic sickle shape of cutting angles makes it possible to push the fibers toward the center and to produce clean burr-less edges. Ideally, the rake angle is between 6 and 15°. The feed rate must be high enough to obtain a smooth surface. Over 1,500 milling operations were completed without any quality loss using a feed rate of 0.3 mm/revolution and a cutting speed of 45 m/min; this represents a 400 percent improvement over the bits previously used.

9294
CSO: 3698/31

SAS TO REBUILD FOUR UNWANTED AIRBUSES FOR FASTER SALE

Stockholm NY TEKNIK in Swedish 22 Jul 82 p 4

[Article by Fredrik Dhejne]

[Text] SAS cannot get rid of its unprofitable Airbus planes.

For this reason, SAS will modify the four planes to give them a longer range. Then there will be a better chance of selling them.

After the modifications, they also will be better suited for charter traffic to the Mediterranean Sea and the Canary Islands.

The planes have been for sale since last spring, but the bids have been too low. It is believed that selling them at a low price would be worse than keeping them for limited use.

Management also has tried to convince the board to approve modifications. The SAS board, however, believed it was too great a risk to invest even more money in the unprofitable planes.

The matter will come up again at the next board meeting this August. Nils Molander, chief economist and vice president, said that the situation had changed and that the board now was positive toward the move.

Must Be Modified

"It has become clear that if the planes are to be rented or sold, they must be modified."

He also said that the charter market was showing a certain upswing and that the sister company of SAS, Scanair, would be interested in the planes if they were given a longer range and more seats.

"Because of the upswing in the charter market and the fact that SAS is doing much better now, the board probably will be more inclined to accept this investment," Nils Molander said.

The modifications will cost about 15 million kronor per plane. The planes

would be provided with the same fuel tank SAS rejected when the planes were purchased.

New Navigational Instruments

At the same time, the planes will be equipped with the same type of radio and inertial guidance system SAS uses in its long-distance planes--the DC 10's and the Boeing 747's.

The modifications could begin early this fall and be complete by March or April of next year.

The modifications take 2 months per plane. The total time will be longer, however, since there is a waiting period for the fuel tanks.

Rebuilt At Arlanda?

The first plane will be rebuilt by the Airbus companies, either at the Toulouse plant or at one of the group's plants in West Germany.

One or two of the planes may be rebuilt at the SAS maintenance shop at Arlanda. Both the know-how and the equipment for major fuselage work are available there.

9336
CSO: 3698/22

MAGNETIC LEVITATION: 'TRANSRAPID INTERNATIONAL' FORMED

Munich-Ottobrunn MBB AKTUELL in German Jul/Aug 82 p 7

[Article by Dr Peter Bittner: "Thyssen Henschel Joins Transrapid Study Group"]

> [Text] Munich/Ottobrunn. At the end of June 1982, Krauss-Maffei AG [Incorporated], Munich, MBB [Messerschmitt-Boelkow-Blohm], and Thyssen Industrie AG Henschel, Kassel, agreed in the future together to develop the Transrapid rail system to the point where it would be ready for use and to prepare its introduction at home and abroad. For this purpose, Arge Transrapid EMS (Krauss-Maffei/MBB), which has been in existence since 1974, was expanded through the addition of Thyssen Henschel and was renamed TRI (Transrapid International). The new name in particular is also intended to take into account growing foreign interest in German magnetic rail system development.

The parent companies of TRI have always been active in the area of rail vehicles, such as locomotives, passenger cars, etc., for commuter and long-distance traffic and are decisively involved in their further development. All of them are pioneers in the rather novel magnetic train system. Between 1971 and 1979, they developed, built, and successfully tested several systems with six vehicles.

As part of the Transrapid Magnetic Rail System Consortium, Krauss-Maffei, MBB, and Thyssen Henschel are presently, together with the firms of AEG [General Electric Company], BBC [Brown Boveri & Cie.], Dyckerhoff & Widmann and Siemens, developing the Transrapid experimental facility in Emsland, with assistance from the BMFT [Federal Ministry of Research and Technology]. This is where trial operations are to be started in the summer of 1983 with the 400-km/hr Transrapid 06.

The following were appointed as TRI business managers: Horst Hessler (spokesman), Erich Eitlhuber, Hans-Georg Raschbichler. On the TRI board, we have Sepp Hort, from MBB, as deputy chairman of the business management, and Johannes Schubert, director, Space Travel Division of MBB. Dr-Engineer Helmut Hucks, a member of the board of directors of Thyssen Industrie AG, is chairman. Other board members are: Dr Hans-Heinz Griesmeier, chairman, board of directors,

Krauss-Maffei AG Munich; Gottfried von Alten, director, Chief of the Transportation Technology Division, Krauss-Maffei AG; Robert Jasper, director, engineer, chief, locomotive production division, Thyssen Industrie AG Henschel, Kassel.

It is the purpose of TRI to develop the magnetic rail system further and, by carrying out studies and planning efforts of all kinds, to prepare and carry out its introduction above all abroad. For example, feasibility studies are already underway for the use of magnetic rail systems between Las Vegas and Los Angeles and Montreal--Ottawa.

Internation cooperation with consultant and industrial enterprises will be very important in the execution of this kind of work. TRI starts with the assumption that construction of the first magnetic rail line for public operation can be started during this decade. MBB expects considerable industrial progress from the activities of this company in the development of the magnetic rail system for the first commercial use of magnetic suspension technology in practical application projects.

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CSO: 3698/35

MBB EXHIBITS NEW WHEEL-ON-RAIL TECHNOLOGIES AT SHOW

Munich-Ottobrunn MBB AKTUELL in German Jul/Aug 82 p 5

> [Text] Ottobrunn. The MBB [Messerschmitt-Boelkow-Blohm] UD (Rotary Wing and Transportation) Division displayed its new technologies in the wheel-rail field to a broad public at the "Transpo '82" transportation exhibit in Munich between 15 and 19 June and on the occasion of the 75th anniversary of the Federal Railroad Central Office in Munich between 25 and 27 June.

In an impressive presentation, UD at Transpo '82 presented technology for the Super-IC, constituting the creative application of aviation and space technology for the wheel/rail traction system of the next generation. A high degree of operational flexibility due to the multiclass concept (one frame or compartment for all interior variants), attractiveness due to the composite [sandwich] fiber material trucks and aluminum frames, as well as a low degree of wear and tear due to wheel sets with adjusted slippage distinguished this 300-km/hr train system.

The FVW [composite fiber material] truck and the wheel set with regulated slippage, which are being developed with the support of the BMFT [Federal Ministry of Research and Technology], aroused great interest among the experts attending the show. Tremendous weight savings are being achieved through the first-time use of composite [sandwich] fiber materials in the primary structure of undercarriages. The wheel sets with regulated slippage stabilize future train systems so that high-speed runs with little wear and tear can be achieved. The transfer of aviation and space technology to rail traffic which has thus been demonstrated is governed by the overall concept of "airplane on wheels."

The UD presented a mockup of the middle car of the R/S-VD (wheel/rail experimental and demonstration vehicle) as an example of future railroad technology at the railroad engineering exhibit on the experimental field of the Federal Railroad in Munich-Freimann on the occasion of the 75th anniversary of the Munich Federal Railroad Central Office. The mockup was developed and built by MBB in close cooperation with the Munich Federal Railroad Central Office. The R/S-VD is the prototype forerunner for the train system of the next generation in the German Federal Railroad. This prototype will start its experimental runs in 1985 with the objective of attaining a speed of 350 km/hr. MBB is decisively involved in its development and construction which is being promoted by the BMFT.

More than 300,000 visitors inspected the mockup during the exhibit. Engineer Theo Rahn, B. S., economic engineering, the president of the Munich Federal Railroad Central Office, displayed particular interest in the model. Visitors were impressed with the high degree of innovation in the train, especially the interior furnishings and the passenger information system. In view of the warm weather during the exhibit, the new air conditioning concept, which is rather new in a rail vehicle, proved to be particularly effective and advantageous.

The display of the mockup was used for an opinion survey. The analysis of the questionnaires showed that 90-95 percent of those questioned considered the innovations presented as being between good and very good. The general layout as well as the concept and execution of the interior furnishings, the information system, the seats, the air conditioning, and the windows likewise met with the approval of the representatives of the BMFT and the German Federal Railroad. In addition to the mockup, the model of the FVW high-performance chassis and the slippage-adjusted wheel set produced great interest.

5058
CSO: 3698/35

DORNIER'S 'NEW TECHNOLOGY WING' IN PRACTICAL USE

Frankfurt/Main FRANKFURTER ZEITUNG in German 27 S ep 82 p 8

[Text] Dornier GmbH, Munich--After a development and testing time of about 2-½ years, the series aircraft of the new Utility-Commuter program of Dornier, equipped with the "New Technology Wing" (TNT), will be delivered to international customers under type-designation Dornier 228.

At the end of August, the second aircraft, using the 228-100 design for 15 passengers, bearing plant number 7003 was delivered to the Norwegian Regional Air Company A/S Norving in Kirkenes. This aircraft will be used in regular commuter air service in North Norway. Norring Flying Service has ordered three Dornier 228's. Almost at the same time, another aircraft rolled out of the final assembly shed. It is intended for the Nigerian Industrial concern Bagudu Construction & Commercial Co. Ltd (BCCC) in Minna. The company has been using the DO 28D-2 Skyservant for several years in industrial liaison service between its various construction sites in Nigeria. In all, 19 STOLL-Utility aircraft of the Dornier 128-6 type with turboprop drive and nine other Dornier 228-100/200 aircraft have been ordered by civilian Nigerian customers.

In India, according to a company spokesperson, the coastguard and regional air companies are interested in the procurement of a larger number of Dornier 228 aircraft. Cooperation in this effort with the Indian aircraft manufacturer Hindustan Aeronautics Ltd. (HAL) in Bangalore is being debated. A Dornier 228-200 is also to be delivered this year to the domestic air line Druk Air of the Royal Bhutan air line in the Himalayas. Thus, for the first time there will be regular air service between the capital city of Thimphu--lying in a deep valley surrounded by 5,000 m-tall Himalaya peaks--and North India, and later with the neighboring country of Nepal.

At the end of July 1982 a Dornier 228-100 performed a demonstration flight to Athens and to islands in the Aegean Sea. Olympic Airways wanted to subject the aircraft to a suitability investigation for Greek Island service. The Dornier 228 proved to be a particularly capable and economical commuter aircraft in extremely short landings and take-offs on the sometimes difficult-to-approach islands.

Another presentation trip to Scotland, South England and to the channel island of Jersey was run at the beginning of September. During an air show in Farnborough/England, the Dornier 228-200 version for 19 passengers was presented.

9280
CSO: 3698/23

ASYMMETRIC STERN IMPROVES EFFICIENCY OF SHIP'S PROPELLER

Duesseldorf VDI NACHRICHTEN in German 6 Aug 82 p 24

[Text] The "Thea-S." (6,118 GRT) multipurpose freighter, which put to sea recently, features a novelty in shipbuilding with an asymmetrical stern developed by the Hamburg Engineering Bureau of Noennecke (with the support of the Federal Ministry of Research and Technology). In this way, engineers are coping with the unfavorable flow conditions encountered along the stern in the upper propeller region. In the case of the MV "Thea-S." this involves a ship type which was developed by the shipyard of Heinrich Brand, Oldenburg, together with Elsflether Reederei Schepers; it is 142.05/111.00 m long, it has a beam of 18.60 m, a molded depth of 6.70/10.20 m, and a draft of 7.70 m; it is registered at 6,118 GRT and can carry 8,367 t.

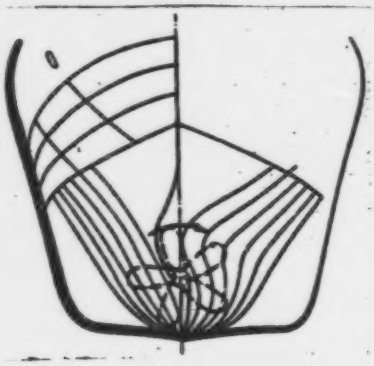
The Hamburg shipbuilding engineer E. Noennecke 20 years ago studied the fact that, in the case of the conventional stern, the water influx toward the propeller runs toward the side where the propeller blade moves upward--especially in the upper waterline region--which is considerably worse than on the other side of the ship.

He developed an asymmetrical stern design where the part of the ship located above the propeller hub is turned with respect to the part below the shaft against the direction of rotation of the propeller. Because of that, the stern water enters the region of the propeller plane, which until now had received a poor influx of water, opposite to the direction of rotation of the propeller, with a forward twist. Here are the results: considerably higher efficiencies of both propeller and engine; this improvement is due to the fact that the flow conditions are distributed over the entire propeller plane.

As we know, the ship's propeller works one-sidedly because its pressure point is not located in the middle of the propeller but is shifted slightly toward one side of the ship. As a result of this, there are minor course deviations while the ship is under way and those deviations must be corrected by moving the rudder in the opposite direction. This is where the asymmetrical stern facilitates considerable improvements.

The measurement runs which were performed prior to the delivery of the ship showed that the output savings of 8 percent--which had been determined already during several model experiments at HSVA (Hamburg Shipbuilding Experimental

Institute)--cannot only be attained but can even be exceeded. With this new stern one can achieve a daily fuel saving of 1.7 t.



The asymmetrical shape of the stern enables us to make sure that the flow conditions along the propeller plane will be improved.

5058
CSO: 3698/36

INSTITUTE STUDIES USE OF COMPOSITE MATERIALS IN AUTO ENGINES

Duesseldorf VDI NACHRICHTEN in German 16 Jul 82 p 8

> [Text] Light and thus energy-conserving materials are again moving forward in the area of vehicle production. Progress has been made in the area of engines where, in cooperation with industry and research, modern composite materials should soon come into use. Compared to conventional metal materials, weight-reductions of more than 50 percent can be attained.

In an initial phase, fiberglass-reinforced plastics (GFK) have been used by automobile firms for low-stressed parts, e.g. radiator grill and body parts, and used sometimes in series production.

In a second development step, highly-stressed components were developed from fiber composites, e.g. drive components, wheel suspensions and shock absorbers. The high strength and rigidity requirements of the components can only be met by optimum alignment of fiber reinforcement. Carbon-fiber reinforced plastics (CFK) are being used preferentially here in winding, prepreg, fabric and tape-laying techniques.

Although weight reductions of more than 50 percent can be achieved compared to conventional steel versions, no such component has yet been used in series production. The reasons for this are the high material costs, the as yet unproven long-term service life and the absence of suitable production methods and equipment for large series.

Stimulated by this research work, the German Research and Test Center for Air and Space Travel (DFVLR) began discussions at its Institute for Construction Engineering and Research in Stuttgart on the use of fiber-composites in engines. By reducing the oscillating mass here, the economy of the vehicle could be improved significantly. Severe difficulties arise with regard to the occurring thermal stress--in addition to the high mechanical load.

The DFVLR presented a 1-cylinder diesel engine experimental model at the Hannover exposition whose piston shaft, connecting rod and various piston bolts were made of CFK.

A part of the weight savings is due to the weight reduction in piston shaft counterweight attained through the reduced mass of piston pin, connecting rod and crank-pin. Planning is now aimed at completing the development of the drive train for mass production. In addition, the test engine shall be used to test elements of the drive mechanism control--like valve lifters or push rods--made of fiber-composite materials.

9280
CSO: 3698/23

BRIEFS

AUTOMATIC RIVETER FOR AIRBUS--Einswarden (wa). With the Airbus in high gear, it has become necessary to redesign the production process in order to attain larger output rates coupled with simultaneously improved economy. This is being done first of all with the help of computer-controlled automats which work not only without noise but above all with a high degree of repetition accuracy. At the Einswarden plant, where Airbus section 12/14 is being assembled, engineers have come a good step closer to this goal with the commissioning of the first numerically-controlled five-axis riveting automat for large Airbus fuselage shells. A second five-axis riveting system of the same design will be placed in production this year. The development of the novel riveting automat with positioning unit, promoted with the help of funds from the Federal Ministry of Research and Technology, was accomplished through cooperation with West German enterprises. The advantage here is that the users were able to put in their own technological requirements during the design and construction phase; besides, future spare parts can be procured on short notice and repairs can be performed quickly. An essential feature of this new riveting automat however is represented by the fact that the riveting program is being prepared not, as customary, at the automat itself, but is rather being drawn up during work preparation with computer support. In other words, the riveting automat can continue to work without any delay while a new program is being punched into a punched tape. In addition to guaranteeing production in high gear it is also possible in this way to obtain the goal of "flexibility coupled with variable version mix." The new riveting automat is so designed that it can be used for all present and future work operations, in other words, also for the A 320. The following statistics will show how decisive the use of fast and precisely working riveting automats is: The total number of rivet positions on section 13/14 of the Airbus is almost 100,000. Of that number, 12,900 drilling operations and rivet placement operations are performed on three-part longitudinal seams in shells plus 15,800 on the main clip connections. [Text] [Munich-Ottobrun MBB AKTUELL in German Jul/Aug 82 p 9] 5058

MAGNETIC LEVITATION TRAIN--The 54-m long "Transrapid 06" magnetic suspension train, which consists of two sections, is nearing completion. One of the two sections will be furnished as passenger compartment and the other one will be fitted out as a measurement instrument car. The cables are currently being installed and work is being done on interior furnishings. One of the two sections--already with its final coat of paint--was displayed at the Transport '82 technical fair in Munich in the middle of June; the second one was available at Krauss-Maffei for inspection in the workshop already with its complete interior furnishings. Plans call for the first complete section to be moved to the Emsland experimental facility in February 1983. At this time, 9.3 km of the experimental track are ready; the track's first phase includes 20.6 km; the installation of reaction rails and stator packages in the long-stator linear engine can thus be started shortly. The experimental center on the track in Emsland is also ready. The initial test stand tests with the suspension chassis of the magnetic supporting and guidance system have already been accomplished successfully. The other system components are in production at the enterprises of the Transrapid Magnetic Rail System Consortium. One can expect initial trials on the test track in Emsland, which in its final version will be 31.5 km long, in the spring of 1983. The project, which is being promoted by the Federal Ministry of Research and Technology, is intended to help maintain Germany's lead in the field of magnetic rail system development. [Text] [Duesseldorf VDI NACHRICHTEN in German 13 Aug 82 p 5] 5058

CSO: 3698/35

END

JPRS 82287

22 November 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 127

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JPRS 82287

22 November 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

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REPORT SUBMITTED ON STATUS OF MICROELECTRONICS

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 12 Oct 82 p 5

[Text] One day before its breakup, the FDP (Free Democratic Party) transmitted to the German Parliament a report concerning the status of microelectronics in the Federal Republic of Germany (Parliamentary Document 9/1988). Previous funding of microelectronics by the government likewise will not be significantly changed in the foreseeable future by the new federal government. It aims towards enhancing the performance capability of the

component industry for development of highly integrated components and systems and close collaboration with research institutes and

small and medium businesses, including software and system houses, in the application of microelectronics.

Early availability of new process technologies is one of the most important preconditions for the fabrication of highly integrated components. According to the government's view, the semiconductor manufacturers in the Federal Republic occupy a technologically leading role here within the European microelectronics industry. Thus, several businesses have started up new production lines which correspond to the most recent state of the art for the production of semiconductor, memories, and microprocessors. Other businesses have specialized on component markets such as entertainment or watch electronics and are there also showing an excellent performance according to international standards.

This high-performance level in technology, however, is not correspondingly reflected in terms of market fractions. The total sales of German industry, in the area of integrated circuits, makes up only a portion of the sales of individual leading American manufacturers.

As a result, the production of electronic components in the Federal Republic of Germany has in recent years stagnated and sometimes even declined. Imports have also stagnated in the last 2 years. In the area of integrated circuits, production did continue to rise. In parallel to this, imports rose likewise. It is interesting that the number of employees in the electronic component sectors has declined in recent years in the Federal Republic of Germany, and specifically by 10.8 percent from 1975 to 1981.

Economic Development in the Area of Electronic Components and Integrated Circuits in the Federal Republic of Germany

Expenditures in Millions DM

Purpose	1975	1979	1980	1981
1. Electronic components				
Production	3,363	4,238	4,372	4,189
Export	2,012	3,412	3,762	3,879
Import	1,980	3,714	4,508	4,552
Employees	71,490	65,140	65,290	63,750
2. Integrated circuits				
Production	300	450	415	432
Export	279	599	869	948
Import	422	1,095	1,694	1,821

In the view of the Federal Government, as far as power components are concerned, the Federal Republic of Germany in the meantime occupies a peak position internationally. Excellent promotional results were also achieved in the special areas of sensors, the link between the physical environment and information processing. But the problem is market conquest. To accelerate introduction into the market, the special program for microelectronics has been in existence for some time. It is being implemented from 1982 to 1984. It is primarily intended to facilitate access for small and medium businesses. The government funding sums are here handled in accord with a simple procedure.

Because of heavy request, this special program was increased from 300 million DM to 450 million DM. In the meantime, there are more than 2,300 applications from about 1,400 businesses which, according to all expectations, will already exhaust available means. More than two-thirds of the applicants are companies with fewer than 200 employees. About one-half of the applications are product innovations in measurement and control technology.

8348
CSO: 3698/41

NETHERLANDS ENERGY RESEARCH PROGRAMS REVIEWED

Anstelveen ENERGY SPECTRUM in Dutch Jul-Aug 82 pp 174-179

[Excerpts] Electrical Energy. The NOW [National Wind-Energy Research] program, initiated in 1976, was completed in early 1981 with the submission of an evaluation report in which the ECN [Center for Energy Studies] gathered the results of the various component activities commissioned by the BEOP [Office of Energy Research Projects]. The NOW goal of attaining quantitative insights into the possible contribution of wind energy to the national energy supply was not fully reached, but the conclusions reached in the report did prompt the government to commission a follow-up program. This National Wind-Energy Development Program: NOW-II aims to promote local uses of small wind turbines and the development of central electrical generation in parks with large wind turbines.

The activities of the ECN in the area of wind energy are directed to contributions to NOW and extend over the total field from local applications to central generation. They comprise by far the greatest portion of the ECN program Electrical Energy. The activities in the field of solar energy in the year under review were limited to supporting BOEP and project designs for the heating of swimming pools.

In regard to the main lines of the National Solar Energy Research Program [NOZ], a number of interesting conclusions can be drawn. Thus, solar heating of swimming pools no longer needs to be a concern of NSERP. For there are presently on the market installations that are fairly efficient economically. Moreover, the technical and economic demonstration of these systems is coordinated in the first instance by the Common Market. And the decision has been made to give much greater attention in the solar boiler program to large-scale technical demonstrations. For this, budget shifts have been introduced that make it possible for the NOZ not only to finance the research aspects, but also to help provide funds for the installations. At this time, there are 12 projects with a total of 15 to 30 installations in the residential housing sector in progress or preparation. There is a pleasing new development that could lead to a solar boiler system of synthetic material whose market costs are almost half of those of the present-day system. A prototype is now being tested.

At the end of the year under review, the government declared its position relative to the recommendation of the Planning Commission Program for the National Coal Research Program NOK. In anticipation of the government position, the OERP,

on the basis of the Planning Commission report and in touch with initiatives in the research world, formulated a number of program proposals which were submitted in September to the appropriate ministries. These proposals addressed approximately 50 projects with a total cost of over 60 million guilders, spread over the following categories: coal cleaning, safety, AFBC, PFBC [expansions unknown], burner development, fluegas desulferizing plaster and coal residues.

Lastly, the contribution of national research on energy storage in flywheels to the Electrical Energy program is considered. For this, ECN has already developed a prototype motor/generator for stationary flywheel application. There are plans to test several flywheels developed by Fokker and TNO from synthetic material in a special installation in preparation for the final testing of the motor/generator system.

On 29 June 1981, the minister of economic affairs placed in operation at ECN the 300 kW horizontal axis turbine with a rotor diameter of 25 m (25 m HAT). The evaluation of this installation, designed and built by FDO in cooperation with other participants, has led to modifications in various system components. The operation management and administration of the pilot program through ECN are presently part of NOW. The control specifications and the pilot research were done by a team under the direction of ECN in which FDO, TH-Delft and TH-Eindhoven participate. In the safety evaluation of the 25 m HAT, experience with methods from nuclear technology were useful. For making the safety recommendation, estimates were made of the personal and collective risks in the case of blade breakage. These activities have laid the groundwork for a general evaluation of the benefit of wind turbines under normal and abnormal circumstances.

The NOW plans for the coming year, among other things, the construction of an initial experimental wind power plant. In consultation with KEMA [Office for the Inspection of Electrotechnical Material], therefore, the ECN continued during the year under review the development of statistical methods for research on the applicability of wind power to the production of electricity. The results attained thus far by ECN suggest that considerable wind power can be used without using costly storage systems such as reservoir basins of the so-called Lievense plan.

The testing of small wind turbines at the ECN test station near Petten is concerned with the characteristics of electrical generation, the benefit of the drift mechanism, the calculation of rpm's, the tower and sail load and the elasticity of the blade stems. In 1981, two wind turbines were tested--for possible assignment to test projects.

An essential step in the introduction of wind energy for local applications is the development of technical regulations for the construction and operation of the turbines. For this purpose, BOEP formed a task force called Wind-Turbine Regulations. Under the secretaryship of ECN, this group has representation from the Work Inspection, Ministry of Public Health and Environmental Hygiene, the Union of Dutch Municipalities, KEMA, NLR [National Aeronautical and Astronautical Research Institute] and TNO [Netherlands Central Organization for Applied Natural Scientific Research]. Several new international activities were

initiated in which ECN has been involved. ECN has taken the initiative to begin cooperation with foreign test stations for wind turbines. ECN has also been designated to represent the Netherlands in several areas of a Common Market wind energy program.

Office of Energy Research Projects

In 1981 great progress was made in the five national research programs that are administered by the Office of Energy Research Projects mainly for the Ministry of Economic Affairs. This has become an exacting and growing task. Here, the BOEP is more and more playing the role of an important clearinghouse on the many problems of using alternative energy sources. On 18 May and 1 October, there were conferences on the wind and solar energy programs, respectively, held in Utrecht where reports were made on the status of the projects.

After confering with the Ministry of Economic Affairs, it was decided to publish a periodical newsletter to meet the need for information about the programs of wind and solar energy. Publication has meanwhile begun. In the usual way, OERP maintained numerous foreign contacts in its field. New contacts were made with Greece, where there is interest in Dutch-developed knowledge and technology for possible uses of wind energy, especially on the numerous Greek islands. This could perhaps create opportunities for Dutch industry for supply contracts.

The first phase of the flywheel program has shown that the best potential uses are in the transportation sector. Along with this, thought has been given to their use in small wind turbines to hold the voltage constant for electricity generated at variable wind speed. Concrete study proposals for use in municipal buses and local trains await the approval of the Ministry of Economic Affairs.

In 1981, there were 24 contracts written, amounting to a total of 26 million guilders, while, at the end of 1981, there were 59 contracts in preparation for a total of more than 45 million guilders. The National Wind Energy Research Program [NOW-1] was formally completed 1 March 1981. The results of the 5-year research and development project are stated in the evaluation report "Perspectives for Wind Energy in the Netherlands." The conclusions and recommendations of the report can be summarized as follows:

--In terms of diversification strategy, wind energy offers sufficient prospects to encourage its application strongly.

--Before it can be safely introduced on a large scale, a great number of problems must first be solved.

--A follow-up program would help eliminate these problems.

--The results of the NWRP show that it is feasible to institute a national strategy stressing the use of wind as a source of energy.

Tangible results of the NOW are:

--The 25 m HAT, placed in operation in June 1981. After the usual lead-in problems, the execution of the actual pilot program was able to get underway in December 1981.

--Implementation of a test situation for small windmills.

--Preparation and partial implementation of around ten test projects for local application of wind energy.

At the request of the Wind Energy Supervisory Commission, and acting on these conclusions and recommendations, the Office of Energy Research Projects has formulated a program of continuation [NOW-II] for the purpose of promoting the careful introduction of central and local use of the wind as an energy source in energy programs of the Netherlands to the end that by the year 2000 there will have been installed at least: 1,000 large units in wind power plants (1,500 to 2,000 MW total power) and 15,000 smaller windmills (450 MW total power).

This 9-year program, subdivided into three phases of three years each, was submitted to the minister of economic affairs for his approval on 25 June 1981. The minister instructed the OERP on 11 December 1981 to execute the first phase of the program. Some important ancillary projects are the design and construction of a large (more than 1 MW) wind turbine with horizontal axis and the preparation for the installation of a small electrical power plant operating on wind. Early in 1981, it was decided to extend the study phase (Phase I) of Dutch research in the area of magneto-hydrodynamic energy conversion (MHD), an advanced system for increasing the efficiency of electric power plants using fossil fuels. On the basis of several sub-studies, various industries have made proposals for research projects in Phase II of the MHD project. Among other things, these call for testing out a MHD burner and developing a generator design. Together with the Steering Committee of the Dutch MHD Project, OERP took the first steps by drawing up a proposal for a program for this second phase.

9992
CSO: 3698/33

BRIEFS

SYNTHESIS GAS--KHD Humboldt Wedag (FRG) has developed a self-heating process for production of synthesis gas of high heating power from any type of coal. The gas produced contains only carbon monoxide and hydrogen that are practically free of carbon dioxide and sulfur compounds, so that in many cases it can be used directly without the necessity of further purification. A typical gas gnnerator consumes 10 tons of coal per hour and works at 10 bars and 1,300-1,400 °C, with production of 20,000 m^3 of gas per hour. The process is based on the dissolution of coal in molten iron contained in the gas generator and on the reaction of the coal itself with the gases that are blown into the molten mass. The gas generator is built of refractory material, and the finely pulverized coal is blown into the molten mass, together with lime and oxygen, from a series of nozzles. Oxygen (or air) and steam are blown from another series of nozzles. The gasification process takes place between the coal and gas present, while the molten iron serves as catalyzer and reaction medium and is not consumed. The gas is freed from the dust by means of a centrifugal separator, and the nongasifiable components (the coal ash and the lime, which serves as a scorifier) are eliminated from the reactor continuously in the molten state. The first applications are expected to go into operation by the end of 1982. [Text] [Rome RASSEGNA PETROLIFERA in Italian 16 Jul 82 p 665] 11267

CSO: 3698/27

'MFL' FORMED, PART OF MACHINE TOOL INDUSTRY RESTRUCTURING

Paris LES ECHOS in French 3 Sep 82 p 6

[Article by Lubka Stephane: "Machine Tools: Official Birth of the French Heavy Machine Company (MFL)"]

[Text] Stockholders and Government to Provide a Billion [francs].

An apparently successful delivery after months of laborious gestation: this morning at the IDI [Industrial Development Institute] headquarters, was born the French Heavy Machinery Company, the cornerstone of the reorganization of the machine tool industry which will make it possible to bring to close the precarious books on Line, formerly number two in the industry. The Institute holds 35 persent of the capital (250 million francs) in the new company of which the other stockholders are, each collecting 7.2 percent interest: Alsthom-Atlantique, Schneider SA, Dassault, Peugeot, Renault, Sacilor, SNIAS [National Aerospatial Industrial Company], SNECMA [National Company for the Study and Construction of Airplane Motors] and Usinor.

The identity of these firms is worth emphasizing knowing that they all use heavy machines and that the problems of the machine tool industry could, at least partially, be solved by reconquering the domestic market.

Hence this commentary from Louis Tardy, boss of Line, named president of the board of directors of French Heavy Machines: "The composition of the stockholders is important because it is not a matter of a purely financial operation but the grouping of companies representing approximately 70 percent of heavy machinery consumption in France. It is not by a pseudotechnical protectionism that a competitive industry making modern production systems will be reconstructed," he adds. "There must be a symbiosis between the study and design offices of the users and the development and marketing offices of the MFL."

Loss of Jobs

That said, the MFL, a holding company, will acquire two industrial subsidiaries with a capital of 100 million francs before the end of the month:

1. For heavy turning: regrouping of Berthier (SNECMA subsidiary) and Saint-Etienne Machine-Outil (bought by Line from Ernault-Somau) as Berthier-Saint Etienne. That company will develop on the Saint-Etienne site only, with the Berthier facilities at Givors being eliminated.

2. For heavy milling: regrouping of TMI Forest at Capdenac (Lot) and Line SA at Albert (Somme) under the corporate name Forest-Line. In this case both sites are being retained.

From a social standpoint, these two operations will result in the elimination of a certain number of jobs (in the first case, 370 out of a total of 1,070 and, in the second case, 270 out of a total of 880), which will be resolved in principle by early retirement departures and reclassifications as well as by the conversion of two facilities at Albert.

One of these will receive a large facility of the ADEPA (Agency for the Development of Automated Production), the other (AMO [Aviation Marine Tooling]) will be taken over, as planned, by the Baburek group and specialize in "retro-filling." Thus Berthier-Saint Etienne and Forest-Line will begin without some of their work force and previous production tools. Recovery and productivity require that. And considerable financing means will be devoted to them.

In fact, the sums to be devoted by the stockholders and the government, including the subsidies required for personnel reclassification, are estimated at a billion francs. As for investments, there is talk of a plan for adding 200 million francs to a corresponding program over a period of 5 years up to the equivalent of 8 percent of gross sales, which currently comes to 600 million francs for the entire group.

The only thing to be added is a wish that, at this price, the heavy machine industry succeeds and, particularly, that orders--essential first of all for survival and, then, for development of this industry--flow in.

9969
CSO: 3102/458

SCIENCE POLICY

FRANCE FAVORS TRANSFER OF CERTAIN TECHNOLOGIES TO ASIA

Paris AFP SCIENCES in French 5 Aug 82 pp 6-7

[Text] Beijing--France is prepared to transfer technologies to China, excluding, however, those which could be of an "offensive" military nature, it was learned yesterday in the entourage accompanying the chief of French diplomacy, who arrived in Peking on 30 July for a six-day visit.

At a press conference held in Beijing on 2 August, the French minister of external relations, Mr Claude Cheysson, and his Chinese counterpart, Mr Huang Hua, emphasized the desire of both their countries to intensify their technological cooperation.

"China," declared Mr Huang, "looks forward to an intensifying of its economic cooperation with the countries of Europe and of the West in general, and with France in particular, in specific domains."

Mr Cheysson, for his part, expressed the view that the memorandum of agreement signed previously by Beijing with regard to the construction by France of nuclear power plants in China (see AFP SCIENCES No. 233 of 23 October, pp 3 and 22) must be "adjusted" to the austerity policy of the People's Republic.

He indicated that a French mission will be coming to China within the next few weeks to discuss Beijing's intentions with respect to nuclear-generated electric power and to set forth France's offering in that domain.

On 5 August, Mr Cheysson is expected to arrive in Seoul where, according to French sources in the South Korean capital, he intends to assure the South Korean leaders of the French government's desire to extend bilateral cooperation with Seoul to all domains, particularly from the economic standpoint.

France, it is recalled, recently obtained a large contract to furnish South Korea two nuclear power plants (see AFP SCIENCES No. 257 of 9 April 1981, p 24).

Seoul will be the second stage of Mr Cheysson's official trip, after Beijing. Upon completion of his visit to Seoul, the French minister will depart for New Delhi (see AFP SCIENCES pp 26, 27 of the present issue) for an official visit to India before returning to Paris. The supplying of slightly enriched uranium is high on the agenda of the talks to be held in India by the chief of French diplomacy, according to a reliable source.

A communique from the Ministry of Foreign Trade, released on 4 August in Paris, states that the French technical mission responsible for studying the terms and conditions of a possible participation by France in the construction of a Chinese nuclear power plant "could arrive in Beijing on 19 August."

The communique states that this mission, which is to be headed by Mr Noel Chahid-Nourai, principal private secretary of the minister of foreign trade, will travel to Beijing and Canton to negotiate with the Chinese regional and central authorities "the industrial and financial terms and conditions relative to French participation in the construction of the first Chinese nuclear power plant, which could be built in association with the Hong Kong authorities in the province of Guandong."

9238
CSO: 3698/21

SCIENCE POLICY

DRAFT BUDGET FOR 1983 GIVES PRIORITY TO RESEARCH, INDUSTRY

Paris ELECTRONIQUE ACTUALITES in French 3 Sep 82 p 6

[Article: "Budget 1983: Priority to Research and Industry."]

[Text] The governmental budget draft for 1983 reflects a priority for research and industry. One notes that the electronics industry is, for the first time, given a total budget of 1.8 billion francs. The funds accorded to research will increase by 17.8 percent in volume and to industry by 23.7 percent in value. Military expenditures are increasing by 10 percent, or less rapidly than in 1982. For the rest, several measures will be taken in favor of employment, and training and education, while special actions will be carried out in favor of energy conservation.

Research: Up 17.8 Percent

The objective of bringing the national research effort up to 2.5 percent of the GNP in 1985 led the government to increase the civilian research budget by 17.8 percent in volume and 28 percent in value, or 32,526 million francs in 1983.

Funding accorded to the development of the electronics and data processing industry has tripled and goes from 640 million in 1982 to 1.8 billion in 1983. If this latter figure is compared to the 140 billion, required by the electronics industry over 5 years, or 28 billion a year, one perceives the importance of this industry from a financial standpoint, even if, as concerns the electronics industry, this budget has to be supplemented by PTT [Postal, Telegraph, Telephone Company] funds, passed in an additional budget, and by investments from public and private firms.

Funding of 500 million capital is planned for CII HB [Data Processing Company-Honeywell-Bull]. The funds planned for the development of aeronautical programs increase from 2.1 to 2.8 billion (up 33 percent). Funding devoted to the space program (development of Ariane, Spot) increase by 24.5 percent (2.3 billion francs in program authorizations). The increase of funding for the development of solar energy is 30 percent (363 million francs in 1983), and the electronuclear program is being continued. The development of biotechnologies is being strongly encouraged.

Industry: Up 23 Percent

The Economic and Social Development Fund (FDES) is not eliminated but its package is reduced to 1 billion francs. Aid to industry will increase by 23 percent, which corresponds to a sixfold increase in funding since 1981. The nationalized sector will receive most of its aid in the form of capital increase (11 billion francs, 7.5 billion of which is for the competitive sector). This aid is to undergo a procedural simplification.

National Defense: Up 17 Percent

National defense funding is being increased by only 10 percent compared to 17 percent in 1982, or 3.9 percent of the GNP. The great priorities remain unchallenged, specifically strategic armament (the nuclear package is up 24.6 percent).

Funding for employment is increasing by 31 percent and should create 1,500 new jobs in research and industry. An effort is also being made in technical training.

In measures taken to promote long term savings, it is planned that a portion of the savings of the French people will be used to finance industry.

9969
CSO: 3102/458

RESEARCH, INDUSTRY BUDGET UP 35.8 PERCENT FOR 1983

Paris LE MONDE in French 17 Sep 82 p 12

[Article by Maurice Arvonny]

[Text] Jean-Pierre Chevenement, the minister of research and industry, and Edmond Herve, the ministerial delegate for energy, presented the draft budget for the ministry of research and industry and the draft civilian research budget, which combines the research spending of all the ministries (spending by the ministry of research and industry makes up 3/4 of this total).

The total figures show some significant growth, much greater than the increases for all of the draft civilian state budgets combined, which is 13.3 percent in value, or 4.9 percent in volume. The civilian research budget is to increase from 25.4 to 32.5 billion francs--with 25.3 billion going to the ministry of research and industry's budget. This is a 28 percent increase.

The other funding--industry and energy--will have a less steep increase, going from 9.4 to 10.9 billion (up 16 percent). If we include 7.3 billion in capital invested in public enterprises--of which 0.5 billion is already included in the research budget--and 2 billion produced by parafiscal fees and the special hydrocarbons fund, we find that the total amount will rise from 38.45 to 52.2 billion francs, a 35.8 percent rise in value (25.7 percent in volume). Even if lumping these figures together in this way may be questionable, it does show a clear priority being given to research, technological development, industrial reorganization, and control of energy. This priority is in agreement with the options which the chief of state has anounced on a number of occasions.

In 1982 the civilian research budget came to a total of 25.4 billion francs, equally divided between ordinary spending and program allocations. The category of ordinary spending, which essentially covers salaries, is to reach 15.2 billion in 1983 (up 19.7 percent). Program allocations will increase even more sharply (36.6 percent) and should come to a total of 17.3 billion in 1983 (see LE MONDE of 31 July).

In accordance with the technological research and development orientation and programming law, the draft budget is split into four categories: mobilizing programs, basic research, applied and finalized research, and technological development programs, to which should be added non-allocated indirect resources. In the allocation among these categories we can read France's scientific policy. There is a very strong increase in funding for the seven mobilizing programs*, for which funding will increase from 5.3 billion to 8.6 billion francs. This rate of increase is 62 percent. It is partly caused by the appearance of two new items, a capital investment of 0.5 billion for CII-Honeywell-Bull, and a "joint charge" of 1.02 billion for the future La Villette museum. But even if we deduct this money, there remains a 34 percent increase which shows how much emphasis is being placed on the mobilizing programs.

The other categories will grow less rapidly: basic research will have its funding increased from 6.3 to 7.8 billion (up 24 percent). funding for finalized research will increase from 3.7 to 4.5 billion (up 22 percent). Four technological development programs** will receive 8.1 billion, compared with 6.6 billion in 1982 (up 23 percent). Indirect funding will increase from 5.1 to 5.5 billion (up 8 percent).

This concentration on seven programs will produce a great disparity in funding for the various research organizations. For example, the INRA's [French National Institute of Agronomic Research] funding will only increase by 15 percent, and that of the CNRS [National Center for Scientific Research] by 16.6 percent, while the CNES [National Space Studies Center] will have

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* Rational use of energy and energy diversification, expansion of biotechnologies, electronics, research and innovation for the Third World, employment and working conditions, promotion of French and dissemination of scientific knowledge, technological development of the industrial fabric.

** Nuclear-generated electricity, space, civil aviation, oceans.

a 27.6 percent funding increase. Resources of the ministry (primarily research funds) will increase by 27.6 percent. The ANVAR [National Agency for the Valorization of Research] will have its funding increased by 19.7 percent.

The law calls for the civilian research budget to increase in volume by an annual average rate of 17.8 percent. In the 1983 budget, this rate is reached, and even slightly exceeded. Another figure stipulated in this law is an average annual increase in staffing levels of 4.5 percent. The draft budget contains 2,462 new jobs (696 scientists and 1,766 engineers, technicians, and administrative personnel), of which 962 are contract personnel whose status is being regularized. The growth rate here is only 4.3 percent.

The rate of 4.5 percent has not been reached in this budget, but the law sets this rate only as an annual average over a 3-year period. At any rate, the number of jobs created is much higher than the first discussions led us to expect. Some concern was expressed during the national colloquium on research and technology about the capacity of our educational system to train the necessary scientists and technicians. On this issue, Mr Chevenement said that as he has kept the commitments to enlarge the budget which he had made, he expects the research personnel to carry out fully the missions which the law assigns to them, that is, training, the dissemination of information, and the valorization of results, in addition to research in the strict sense of the term.

The "industry and energy" aspect of the budget comes to a total of 12.7 billion francs--of which 1.8 billion has already been included in the civilian research budget, which leaves a balance of 10.9 billion francs. In order to determine the cost of the entire industrial policy, we should add 7.3 billion francs in capital investments in national companies. This figure includes 0.5 billion for research for CII-Honeywell-Bull.

The 10.9 billion francs include 3.1 billion in funds for industrial interventions. This is up 39 percent from 1982. The essential part of this increase is due to the strong rise (more than doubling) of the funds allocated to electronics--1.35 billion francs compared with 0.64 billion the previous year. These funds also include 160 million francs for the activities of qualification, standardization, metrology, safety, etc. 25 new jobs are being created in the field of nuclear safety.

For energy and raw materials, we find a reduction from 1.43 billion to 1.17 billion francs in funds allocated to the Energy Control Agency. The justification is that this agency will receive 2 billion francs from the special fund for major projects, which is to be distributed during the 1982 and 1983 fiscal years.

A large part of this is the subsidy granted for France's national coal production, which is increasing by 26 percent. Amounting to 6.5 billion, this is half of the industrial interventions fund, which comes to a total of 13.1 billion, and includes some funds such as ANVAR funds which are included in the research part of the budget. Mr Chevenement also gave some information on the tax credit for businesses which are involved in research, pointing out the inadequate number of such companies--less than 2,000. A fourth of the difference in the volume of research spending between the 2 consecutive years may be attributed to the income tax or the business tax. The minister expects that this measure will produce 4,000 or 5,000 companies doing research by 1985.

7679
CSO: 3698/13

GOVERNMENT SEEKS MORE RESEARCH-INDUSTRY TECHNOLOGY TRANSFER

Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG in German 19 Oct 82 p 4

[Text] Bonn, 18 Oct--After the shock of the cost explosion in connection with the two large reactor projects, the new Federal Research Minister Riesenhuber is pondering new possibilities for promoting research or innovation, which will cost little or no money, and in the long term could even make a little profit. Besides indirect (tax) promotion of industrial research and development, which is to be expanded at the cost of the direct funding of about 6,000 individual projects--an old concern of the two current coalition parties--it is technology transfer from science to application from which Riesenhuber is hoping for an impulse in the direction of technical and scientific development. In part, he can here fall back on a set of tools that has already been created during the previous years. But research policy will in the future stress more strongly than before the autonomous cooperation between research and industry as well as market forces; the government should create the framework conditions for this, for example by eliminating bureaucratic obstacles, and by helping to stimulate the conversion of research results into inventions. At a symposium of the Federal Ministry for Research and Technology, on the topic of "Technology Transfer From Research Institutions" in the scientific center in Bonn, showed how important this topic will be in the future for the research policy of the federal government, where there are opportunities but also where there are obstacles.

The central position was occupied by the 12 major research institutions. It was Riesenhuber's criticism that they had not sufficiently fulfilled their function as a bridge between basic research and industry. The government funded them with copious means, but the resulting know-how and the resulting effect on the market were not satisfactory. The major research institutions should be more strongly guided by this objective, to use their research results in an economic sense. However, the self-image of scientists is not the least obstacle to this, according to which they still perceive themselves as "far in advance of industrial application." The major research institutions do not regard technology transfer as their main task: In the future, too, they want to concentrate on a few major programs and do not wish to diversify--so said the chairman of the Working Community of major research institutions, Gisbert zu Putlitz. However, even in the research institutions, market-oriented thinking should not be rejected as irrelevant, but should be recognized as a boundary condition of research. As a stimulus for the scientists, the research minister announced a prize of 30,000 DM. This was to distinguish top performance in technology transfer.

Although the major research institutions are slow to change their course--there are considerable thresholds to pass on the other side too. The member of the board of Siemens AG, who is responsible for research, namely Mr. Beckurts, talked about "Contact Phobias." For medium industry, Hartmut Scheller, Kleindienst GmbH, Augsburg, pointed to the large communication difficulties between research and business: Not technology transfer but a transfer of understanding supposedly is necessary. Beckurts urged that the research institutions organize open-house days, especially for interested parties from industry. However, on the part of industry, there also must be readiness to develop new technologies, even outside their own laboratories, with the aid of the government research potential. As an important means for transferring knowledge and skills from science to industry, a job change of employees between the two areas was mentioned. However, obstacles involving administration, salaries, and fringe benefits stand against such a move. At this time, the Research Ministry is examining the idea of establishing a fund for industry, by means of which highly qualified scientists can be brought into the major research institutions or can be maintained there; regardless of the business, this fund should make possible payment beyond the government salary ordinance.

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CSO: 3698/41

FRENCH, GREEK SCIENTIFIC COOPERATION TO INCREASE

Paris AFP SCIENCES in French 5 Aug 82 p 1

[Text] Athens--France and Greece will be developing their cooperation in the field of scientific research, particularly in the domains of new energies, biotechnologies, electronics and the humanities and social sciences.

In a joint statement published in Athens on 31 July at the conclusion of the official visit there by the French minister of research and industry, Messrs Jean-Pierre Chevenement and Georges Lianis,the Greek minister of research and technology, expressed the desire that this cooperation be intensified through an exchange of researchers and technical specialists and through the training of mixed research teams.

This cooperation is to carry over into specific projects, notably geothermal, wind-power and solar-energy ones. Mr Chevenement indicated that a mission from the French Agency for the Harnessing of Energy will be arriving soon at the Aghia Roumeli Solar Energy Plant in Crete.

France and Greece also want to carry out multilateral research projects on a European and Mediterranean scale. Within the EEC [European Economic Community] framework, a project of Greek origin has been put to study, having as its object applied research and technology in the domain of alternate sources of energy.

The day before, Mr Chevenement, who had been in Greece since 29 July, took part in a round-table discussion at the Greek National Research Institute.

The return to economic growth, he stressed during that discussion, must come about through scientific research and technological innovation. He pointed out that, in 1982, France's domestic expenditure on research has represented around 2.2 percent of its gross domestic product, putting France on an equal footing with Japan and the FRG [Federal Republic of Germany] in this domain. This is France's highest rate since 1967 (also 2.2 percent), Mr Chevenement remarked.

France's new research policy, he added, is a "highly voluntaristic" one, made possible by the existence of a strong economic public sector, and--

one oriented toward intensified solidarity with its EEC partners and with the developing countries. "No research worthy of the name is possible," Mr Chevenement said at another point in the discussion, "unless it is sparked by freedom. France has chosen the difficult road of socialism within a framework of freedom midway between multinational capitalism and bureaucratic communism."

During his official visit to Greece, Mr Chevenement visited the Greek nuclear power plant "Democritos" at Athens, and the Greek Pasteur Institute, where he inaugurated an ultracentrifuge which is to be used in virological research.

The minister, who was accompanied by Messrs Jean-Francois Poly and Raymond Dedonder, respectively president of the INRA [French Institute for Agronomical Research] and director of the Pasteur Institute, also met with Prime Minister Andreas Papandreou, with whom he discussed, in particular, President Francois Mitterrand's forthcoming visit to Greece (around the beginning of September).

9238
CSO: 3698/21

PARIS AUTO SHOW MIRRORS WORLDWIDE COMPETITION

Paris LE MATIN in French 30 Sep 82 p 17

[Article by Henry Lauret]

[Text] The Paris auto show opens today at 1300. This exhibit, which is held in Paris every 2 years, will be officially inaugurated tomorrow by President Mitterrand. A big crowd is expected at the Porte de Versailles, where automobile manufacturers from all over the world are showing off their latest developments.

The real issues are hidden behind the show's facade. Today the automobile industry is still resisting the economic crisis which is disrupting the world. But the markets are no longer expanding in most of the regions concerned. Bernard Hanon said yesterday that all hypotheses used show that a threshold has been reached in western Europe: the automobile by itself accounts for 13 percent of household consumption. In the United States, this figure is 14 percent. This means that it is a significant expense for the customer, who is becoming more and more sensitive to the level of operating costs. In 1961 it cost a metallurgical worker 1,750 hours of work to buy a car. In 1982, it costs 890 hours. But this trend is certainly leveling off now.

Henceforth, the battle of the automobile industry will be fought more than in the past in the areas of technical development, innovation, and competitivity. The head of Renault, speaking of this yesterday, told the press of the fundamental objectives he has set to take up the challenge of competition (see LE MATIN of 29 September). Starting in 1983, Renault each year will introduce a new model and a new plant--that is, it will either adapt its existing plants or will establish new ones in order to achieve levels of productivity equivalent to those in its Douai (R 9) plant--and a new foreign market. Last year, the new foreign market was Portugal. This year, Renault is introducing

its Alliance in the United States and Canada (its goal is sales of 100,000 cars a year). "The worldwide dimension is the only dimension for the automobile industry," says Bernard Hanon, who rejects any protectionist maneuvers between the European auto manufacturers, and who feels that cooperation agreements between different makes have limits built in by the concept of competition.

At a time when there is talk of a reduction in production cycles, of the development of standardized platforms for different models, of "onboard" electronics, of plastic transmission systems, of robotics or automated production, etc., the automobile industry can no longer afford to simply meander along.

The Big World Battle is at Its Height

There is a recession in Europe, and a depression in America. The automobile industry obeys the major laws of the worldwide economy, even if there are exceptions which serve to prove the rule. And France, as we know, is one of these exceptions. Against all expectations, auto registrations this year should exceed the number in 1981 by nearly 10 percent. Who can tell why? That's just the way it is.

Taken all together, worldwide production is down this year. The giants in Detroit, General Motors, Ford, and Chrysler, are reorganizing to fit a North American market which has dropped from over 9 million vehicles a year to a rate close to 6 million. And in addition, the Japanese, who last year led the world in production, are no longer expanding in this market because an implicit quota has been set on Japanese imports.

So, while the big--and the not so big--companies are now showing off their latest developments at the Paris auto show, there can be no doubt that offstage, the big world battle is at its height. After saturating the U.S. market, the Japanese seem to be observing a slowdown in Europe. But let there be no mistake about it. This is certainly just a period of consolidation in preparation for a new offensive.

GM and Ford have not been wasting any time. GM, number one in the world, has invested billions of dollars in Spain, setting up a production capacity for 270,000 cars a year, destined essentially for West Europe. The little Corsas are made there in excellent productivity conditions. Ford, whose Cologne plant also has an excellent productivity record, is bringing out its Sierra against the 7/9 CV of Renault, PSA, and Volkswagen.

In a world in which surplus production capacity is growing, there is no way out without an adjustment of competitivity, starting from the top down. Fiat, which recovered its health by laying off some 30,000 workers in Turin, which it was able to do without political damage, is now in a good position. Particularly as the exchange rate of the Italian lira does give it a certain monetary advantage. British Leyland, which in just a few years had dropped to 18th place in the world, is trying to survive through the ironfisted leadership of its president, Michael Edwards. And also through cooperation agreements with Honda of Japan.

While Mercedes and BMW are remaining outside these agreements for the time being, and Volvo, taking advantage of its own special appeal, is doing extremely well after succeeding in a spectacular diversification into oil, Volkswagen/Audi is recovering. In Brazil, where VW dominates the market, the company is once again making money. But the German company will have to revise its strategy in the United States, where it was too quick to think that the historic success of its Beetle could be repeated with the Rabbit. VW learned an expensive lesson there.

In the midst of this international concert, Renault and PSA have had different fortunes. Renault, for a pricetag of $370 million ($1 = 4.30 francs, fortunately), bought the American Motors facilities in Kenosha; a rather decrepit network of 1,300 distributors, but with a total sales potential of 100,000 vehicles in America. The future will tell whether or not the Alliance, the American version of the R9, will change Renault's bad luck in the United States.

But Renault will not stop its expansion abroad there. It is essential to move forward, Bernard Hanon, the head of Renault, told LE MATIN yesterday. PSA is obviously counting on its new Citroen BX.

It is time for Peugeot to bring out new models demonstrating some new life in the company. The 205 is scheduled for the spring of 1983. Until then, Peugeot/Talbot will rely on its policy of design changes in the existing line. The "digestion" process here has been a difficult one, and it is not over yet. Citroen was and remains a healthy company, and a car with a good reputation.

The Peugeot/Talbot partnership is, to say the least, rather unequal. But if Peugeot had not bought out Chrysler's European subsidiaries, what wouldn't have been said if these assets had been taken over by the competition? Everything has its price, even defensive actions.

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CSO: 3698/17

RENAULT 'VESTA' EXPERIMENTAL VEHICLE EXHIBITED AT SHOW

Paris L'HUMANITE in French 30 Sep 82 p 12

[Article by Jacques Moran]

[Text] One experimental vehicle follows another. After Peugeot's VERA series, Renault yesterday introduced its second prototype, the VESTA [Advanced System and Technology Fuel-Efficient Vehicle] at the preview of the Paris auto show. The VESTA represents a new generation of fuel-efficient cars. EVE was designed on the basis of an R18. The VESTA is a distant relative of the R5. According to Renault, "the design of this prototype is based on our intention to develop a product with wide public appeal in the 1990s."

The VESTA consumes no more than 3 liters per 100 km. It can carry four people and offers a level of performance, comfort, and safety that is at least equal equivalent to today's cars, says Renault. The vehicle has a CX [Air Penetration Coefficient] of 0.22, which is a remarkable performance for a small car. It uses a good many light materials which have given it a 30 percent weight savings over the R5.

The VESTA has front-wheel drive with a transversally-mounted engine, but Renault has made only the first tests with a gasoline engine. The fuel consumption is: 2.28 liters at 90 km/hour, 3.64 liters at 120 km/hour, and 3.04 liters for city driving. The average consumption amounts to 2.99 liters.

The VESTA will not be completely ready until the end of the year, and the major work left to be done will concentrate on lightening the vehicle, which might weigh as little as 520 kilos, almost 2 times less than a standard R5. More detailed studies on the engine might further lower fuel consumption. The length of the vehicle is 3.20 meters.

Peugeot, with its "VERA plus," and Renault with the VESTA have now developed a car which consumes less than 3 liters, the goal set for 1985 by the government. The first assembly-line models derived from these prototypes might be ready before 1990, and we do know that Peugeot has already used several technical solutions used in the first VERA prototypes. Might the VESTA be ready by 1985 to prefigure the new generation of the R5?

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CSO: 3698/17

BRIEFS

ALFA-NISSAN AUTO--Date of introduction of Alfa-Nissan cars confirmed: At the conclusion of a meeting between the president of the Fund for the Mezzogiorno, Massimo Perotti, and a delegation from Alfa-Nissan led by the company's president, Corrado Innocenti, and its vice president, Massimo Takeiahi, it was confirmed that the Italian-Japanese firm's first cars will come out of the Pianodardine (Avellino) plant in July 1983. The factory, installed on an area of 208,000 m^3, will employ 1,042 persons full-time. The cost of the fixed investments has been estimated at Lit 62.2 billion; the Fund for the Mezzogiorno has participated in the enterprise in the amount of Lit 38 billion, and will also provide Lit 17 billion in financing for construction of the firm's infrastructures. [Text] [Turin ATA-INGEGNERIA AUTOMOTORISTICA in Italian Jun 82 p 474] 11267

CSO: 3698/27

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JPRS 82367

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West Europe Report

SCIENCE AND TECHNOLOGY

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WEST EUROPE REPORT

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BIOTECHNOLOGY

FRG WILL REDIRECT, INTENSIFY EFFORTS IN GENETIC ENGINEERING

Duesseldorf VDI NACHRICHTEN in German 13 Aug 82 p 1

[Text] The Federal Ministry for Research and Technolology (BMFT), which has 1983 biotechnology development funds amounting to 14.5 percent more than those for the previous year, wishes to establish new emphases in its development program. In presenting his budget for 1983, Dr. Andreas von Buelow, the federal minister of research, said that it was not only a matter of achieving a high scientific standard but also ensuring industrial connections at the proper time.

The biotechnology performance plan of the BMFT encompasses the years 1979 to 1983. In other words, it must now be renewed. The development of a number of programs and projects terminates in 1983, i.e., the project involving pest control with natural substances. New emphases will take their place or old ones will be expanded in specific directions. Reference is made to research on plant and animal cell culture technology which in the future will be concerned more intensively with material production. Genetic engineering, which to date has been worked on in isolated projects only, will be the object of a more systematic focus in the future.

The opportunities for this are being made available by cooperative arrangements between German enterprises and research institutions started in accordance with Hoechst-Harvard-Schock. After Bayer AG, Leverkusen, had made an agreement with the Max-Planck-Gesellschaft at the end of May for genetic engineering projects to be performed jointly at the Max-Planck Institute for Breeding Research in Cologne, for which Bayer will make available one million DM annually for 3 years, BASF Ludwighafen made an agreement with Heidelberg University to provide one million DM annually for 5 years for genetic engineering research. In Heidelberg, there is some idea of setting up a biotechnological "industrial park."

In the joint development of these installations, the BMFT sees industry's role as including a contribution to the personnel costs for top researchers. This development is noteworthy in that industry is now more interested than before not only in project development but also basic research. The ministry is interested in greater promotion of joint biotechnology research by a group of companies.

In cooperation with the German Academic Exchange Service, the BMFT wants to try and stop or even reverse the emigration of biotechnology scientists to the United States. A special stipend program is intended not only to facilitate specific-term stays of German researchers in the United States, but also to make it possible for foreign scientists with special methodological knowledge to work in Germany for 1 to 2 years. Finally, there are to be research grants for German biotechnologists returning from abroad.

The BMFT will not take the initiative in establishing genetic engineering firms. Its development will be concentrated on specific scientific foci; requests will be evaluated within the customary scope of project development processes. On the other hand, the "Fund for Biological Chemistry" just established by the chemical industry will act in a "surface-covering" manner. An amount of 3.6 million DM is to be made available over the next 2 years. This fund functions according to the principle of the chemical industry fund: Basic research will be promoted, without any relationship to application and without any research programs.

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CSO: 3698/54

SCHERING JOINS GROWING GROUP OF GENETIC RESEARCH COMPANIES

Duesseldorf WIRTSCHAFTSWOCHE in German 1 Oct 82 p 136

> [Text] Genetic engineering, the scientific field of the future, is being established the world over. Among the German companies, Schering is taking a significant step into the future, with the help of the government.

A field which has advocated mutation is itself mutating. While a new group to ensure genetic engineering (cf. sidebar) is forming in Sweden, Schering AG is establishing an institute for genetic engineering research in conjunction with the District of Berlin.

Genetic engineering has for a long time been the object of both multiregional and worldwide cooperation and rivalry. For example, since 1981, Hoechst AG has been promoting research in genetic engineering at Harvard University. And Denmark's Nova Industry pulled a triple coup in May 1981: As a result of a stock sale on the New York Stock Exchange, the clever Danes not only acquired international capital but also the respect of the American competitors Eli Lilly and Miles Laboratories, and that of Gist-Brocades of the Netherlands.

The international debate over the best starting places for the genetic engineering field of the future results from its possibilities which cannot even be evaluated in terms of their inception (WIRTSCHAFTSWOCHE 37/1980). For 1990, the market volume is estimated at a worldwide total of 7 billion DM, and for the year 2000 the figure is astronomical. The causes: Innumerable products in the chemical industry can be produced more cheaply with genetic technology. However, the fact that entirely new substances can be obtained would appear to be even more important.

This also explains the hunt for patents. It has been said that the American company Genentech has already registered 500-600 patents all over the world. Schering is following a somewhat different course than Genentech with the newly established Berlin institute: The expenses of 80 million DM which have been estimated for 10 years are to be divided equally within the District of Berlin, and in addition to that federal funds will also be used. The institute is to maintain divisions for microbiology, biochemistry and molecular genetics. Schering's approach is "to do justice to the breadth of the subject with the multiplicity of the research projects."

[Sidebar:] Swedish Involvement

The Swedes also want to participate in the worldwide boom in biotechnology. The machinery plant Alfa-Laval AB and Cardo AB, the sugar producer, have formed a joint company, Biotechnics AB, which is to have a starting capital of 50 million Swedish kroner (approximately 20 million DM). The company is intended to bridge the gap between the results of genetic research and its industrial application. It has been a long time since biochemists were concerned solely with the creation of resistant grain varieties and yield-increasing feeds. The know-how of the companies establishing the new firm is promising for Biotechnics. Alfa-Laval has experience in food production while Cardo will contribute knowledge of genetic engineering. The new company is to start operation in 1983. Sales goal for the first year: 100 million kroner.

7072
CSO: 3698/34

SHORT HISTORY OF BIOTECHNICAL RESEARCH IN GREAT BRITAIN

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
18 Oct 82 p 7

[Text] London, 17 October (vwd). The euphoria of recent years, which had put biotechnology alongside microelectronics as the trailblazing innovation of this century, has evaporated. The enormous application potential of biotechnology has of course not been lost with it. Biotechnology has existed for six millennia, under other names, since bread has been baked, beer brewed, and cheese made. It was nevertheless not until the 1940's that the incidental products of microorganisms became controllable through microbiology. With manipulation and the transfer of genetic codes from one organism to another biotechnology made a breakthrough in the early 1970's. But it is a longer road from the laboratory experiment to industrial exploitation. In addition it was quite overlooked that a market had to be created for the new products, with the possible exception of medicines.

Little Success in Protein Production

Already in the 1960's the oil companies BP [British Petroleum] and Shell went into biotechnology, since they wanted to produce protein industrially. Both gave up the project. They are now concentrating on the use of bacteria in oil conversion and extraction. ICI [Imperial Chemical Industries] has also been trying for 14 years to produce single cell protein for animal feed (Pruteen) and has invested 40 million pounds sterling in it at Billingham. Since the yield now as before leaves much to be desired, ICI is now going into genetic engineering.

Other British enterprises have also been active for years in biotechnology, including the flour and bakery products manufacturer Rank Hovis McDougall for the past 18 years. Among the others are the chemical firms Glaxo and Beechan, the cane sugar enterprise Tate & Lyle, the breweries Allied Breweries and Grand Metropolitan, the food products firm Spillers/Dalgety and the machinery manufacturer John Brown. While Tate & Lyle have already again reduced their commitment to biotechnology, Grand Met has started off in a new direction. They have been participating, to the extent of 4 million pounds sterling, in the Swiss Biogen. All the same, the hopes that Biogen would build a plant in Great Britain because of the British link have not been fulfilled.

Attempts At a Realistic Exploitation

A few weeks ago 4 firms, John Brown, Dalgety, Gallaher, and Whitbread, decided to break a basically new path in the direction of biotechnology. They supported the research at the biocenter of the University of Leicester. The University of Swansea also works closely with the British biotechnology firm Bio-Isolates, which produces food additives based on protein. This small firm, whose shares were introduced only in July, has a patented process for the extraction of pure protein from milk, which as a cheap raw material will be converted into alcohol, medicines, and feed additives with the help of recombined bacteria.

The other British biotechnology firm, Celltech, is undertaking a more realistic approach to the exploitation of the results of reasearch. It is concentrating on two fields, DNA recombination and cell hybridization, in which the research results will be developed into industrial utilization. Two thirds of the effort are aimed at health protection and hygiene. The main sources of income are research contracts from industry, sale of interferon, and issuance of licenses. Celltech is the only British enterprise which conducts DNA splitting.

The Genetic Manipulation Advisory Group (GMAG) exercises surveillance to ensure that there is no abuse of the roughly 10,000 biotechnical patents which were registered in Great Britain between 1970 and 1908. 103 research and production sites active in biotechnology are registered, including the large users, G.D. Searle in High Wycombe, ICI in Billingham, and Dista in Liverpool. GMAG, which was brought into existence 3 years ago demands that it be informed at the earliest possible stage if work is to be carried out with the purpose of placing genetically manipulated organisms or plants in the environment. GMAG members are furthermore instructed to provide detailed data on experiments and field tests. The early fears that broadly disseminated microorganisms unintentionally might be converted into dangerous species have nevertheless proven groundless. Virtually all gene manipulations can in the meantime be undertaken with "enfeebled" cell components, which are capable life only under certain conditions or for only a short time.

The intensified efforts in the field of biotechnology have led in Great Britain also to the founding of the British Coordinating Committee for Biotechnology (BCCB), which was put together in 1978 from 7 individual associations. The most recent task of the industry association is to devote itself to the coordination of private industry and government projects. In order to prevent in biotechnology the same sort of failure as occurred with the government supported excursion into office technology of the future, Minister of Industry Patrick Jenkin not long ago made the prudent attitude of the government clear: "The government must support basic research where commercial exploitation is not evident." The multi-party committee of the lower house for biotechnology even determined that basic research is in danger.

Deficiencies in Basic Research

The Committee for University Assistance is particularly in no position to cover the funding needs of the research councils. In actuality basic research in Great Britain is in a bad way not only in biotechnology. Hardly any comprehensive and conscientious research is being conducted except at the universities of London,

Oxford, and Cambridge. Private industry prefers to invest in licenses and in purchases of firms with the appropriate know-how. This is precisely what has been established by a joint study of the Advisory Council for Applied Research and Development (ACARD), the Advisory Board for Research Councils (ABRC), and the Royal Society. British industry, it says, has up to now been incapable, unwilling, or insufficiently alert to seize upon the advantages of the potential of biotechnology.

It says that investments have been low and opportunities to create and deliver products domestically and abroad have been missed. Industry must react more rapidly to challenges and to reverse the trend which has begun for foreign firms to be more ready than the British to exploit the expertise of the universities and research laboratories. Some of the competitors of the British in Germany, Japan, and America have already clearly invested more in the development of biotechnology.

One of the main reasons for the slow British reaction is the poor coordination. Industrial success and growth depend to a great extent on the adequate resupply of trained workers and the flow of research data from a series of various disciplines. Along with this, says the study further, the multiplicity of the applications of biotechnical products indicates an obstacle in that the resources are relatively thinly sown. Many people and organizations in Great Britain are said not to be aware of the importance of this potential. After Great Britain fell asleep at the switch with regard to microelectronics, the country is in a fair way to miss out on biotechnology as well.

6108
CSO: 3698/48

INDUSTRY, RESEARCH, GOVERNMENT BIOTECHNOLOGY PROGRAM

Copenhagen BERLINGSKE TIDENDE in Danish 21 Oct 82 p 5

[Item reported from London: "Cooperation Between Industry and Research"]

[Text] Sweden's largest bioengineering and chemical firm, Fortia in Uppsala, recently agreed to participate in a 6-year bioengineering research program in cooperation with Uppsala University.

The Swedish government, through STU, the Swedish Technical Development Council, will share with Fortia the expenses for the program to the tune of 36 million Swedish kroner. Such cooperation between industry, research and the government is unusual in Sweden.

The goal of this work is to gain a better insight into the function of living cells. They are very important to chemical firms for the manufacture of many different chemical and medical products in the most energy-saving and often environment-protective manner.

The research will take place at Uppsala University's Institute for Cell Research under the direction of Professor Per Peterson, but some of Fortia's leading scientists will be part of the research group.

All research results will--in any case the theoretical--be accessible to any firm, but Fortia will receive first rights to the group's results.

However, Fortia is not basing its future in the bioengineering field but aims to become a supplier of equipment and materials to firms, e.g., Celltech and Biogen, which concentrate on the manufacture of new forms of bioengineering medicine.

Professor Kurt Skagious, who is Fortia's vice-director and chairman of the Swedish Association of Bioengineers, says that the biggest problem for bioengineering firms is to extract the chemicals which are produced in cells.

"The methods we know today for extracting chemicals can be compared with smashing cells with a very big hammer," says Professor Skagious. "Then we rummage about in the remains to find what we will use."

Therefore, the research group will only draw upon the department involved in separation of chemical products for the pure production of bioengineering components.

8985
CSO: 3698/54

THREE COAL LIQUEFACTION PILOT PROJECTS DISCUSSED

Bottrop Plant

Graefelfing ENERGIE in German Jun 82 pp 169-170

[Article by E. Wolowski, O. Funk, Bottrop*: "Coal Oil From Bottrop"]

> [Text] "Presently not economical" reads, of course, the result of the Ruhr Coal study concerning the construction of a full-scale coal liquefaction facility. Nonetheless, according to RAG, there can be no let up in this field if the FRG is to maintain its technological lead. The 200 t/d Bottrop installation can contribute to process optimization and component development. However, construction of a full-scale facility remains indespensable at least as a reference facility for export contracts.

The German development of the process for liquefaction of hard coal is based on the IG process which was commercially tested in Germany until 1945. However, the process has been modified in the following significant aspects:

--Pressure reduction from 700 to 300 bar,
--Separation of reaction products by distillation, and
--Production of hydrogen by gasifying process residues.

An increase in thermal efficiency, and thus economy, is expected from process improvements and improved heat recovery.

After German laboratory tests of the process, two pilot plants--the Saar Mining Company's 6-t/d installation and Bottrop's 200-t/d plant--were built. The Bottrop coal oil pilot plant is presently the largest coal hydrogenation plant in Europe and has a capacity comparable to plants in the United States.

It is situated next to a coking plant which delivers the coal for processing via a reversible belt conveyor. Process residue is also removed by the same

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*Dr Ing Eckard Wolowski, Dr rer nat Otto Funk, Ruhrkohle Oel und Gas GmbH, Bottrop

It is situated next to a coking plant which delivers the coal for processing via a reversible belt conveyor. Process residue is also removed by the same conveyor. The hydrogen required for liquefaction is drawn from a pipeline belonging to the Huels Chemical Company AG which runs along the property line of the plant.

200 Tons of Ruhr Coal Yield 98 Tons of Coal Oil Daily

A highly volatile coal from the Ruhr district designated as standard coal is initially planned to be the conversion coal for Bottrop; however, other coals will also be processed in the pilot plant (Table 1). Table 2 shows data on process materials and products for standard coal. The data are based on test results of the continuous laboratory facility of Mining Research GmbH in Essen.

The coal, dried to less than 1 percent by weight and ground to less than 1 mm, is mixed with coal produced in the process and wet milled to a particle size of less than 0.2 mm with simultaneous addition of the iron catalyst. The finished mash is compressed to 300 bar and heated together with fresh hydrogen and system gas to 425 degrees C. This reaction mixture ascends through three reactors in which at 300 bar and a maximum of 475 degrees C the exothermic hydrogenation reaction--the cracking of the coal into gaseous and liquid products--takes place.

Table 1: Specification for Conversion Coals

	Standard Coal	Range
Short Analysis:		
Ash (percent by weight, water free)	4.5	3.0--17.0
Volatile constituents (percent by weight, water and ash free)	37.9	10.0--53.8
Elementary Analysis: (percent by weight, water free)		
Carbon	84.3	75.0--93.0
Hydrogen	5.0	3.5-- 7.0
Oxygen	7.2	1.5--17.8
Nitrogen	1.7	1.0-- 1.9
Sulfur	1.7	0.5-- 5.4
Maceration Composition: (percent by volume)		
Vitrinite	64	61 --77
Exinite	17	5 --20
Inertinite	14	1 --14

Table 2: Process Materials and Products (Standard Case)

Process Materials:		
Coal (water and ash free)	200	tons/day
Catalyst (Fe_2O_3)	4	"
Hydrogen	220,000	m^3/day
Products:		
Gases (C_1, C_2)	22	tons/day
Gases (C_3, C_4)	18	"
Light oil (200 deg C)	22	"
Medium oil (200-325 deg C)	69	"
Heavy oil (greater than 325 deg C)	--	"

Separation of the reaction products takes place in the adjoining separators. The top product of the hot separator is separated into light-, medium- and heavy-oil fractions after condensation. The noncondensable fraction is recirculated as system gas after washing. The sump product of the hot separator contains all solid residues, thus the coal ash, the unconverted coal and the spent catalyst. After decompressing the hot separator, the sump product is processed into heavy coal oil and residue by vacuum distillation. The coal oil is used to prepare the coal sludge; the hot fluid residue is poured onto a cooling conveyor where it solidifies. At the end of the cooling conveyor, the residue is crushed and moved to the coking plant.

Initial "Coal-In," November 1981

The operational phase of the Bottrop coal oil plant started on November 25, 1981. This was the day of the initial "coal-in." By the end of 1981, several test runs with coal had been completed during more than 300 hours of operation under relatively mild conditions below the design values to shake down the initial complement of parts and equipment. Problems which were encountered and fixed during this period occurred mainly in the hydrogen compressors and in the decompression system.

During the tests which continued into the first quarter of 1982, problem parts were improved. By this time, the facility had logged about 2,000 hours with coal and had processed about 8,000 tons of coal. Also, during this period coal throughput was upped to the design value. Initial test tuning runs will be completed by the middle of 1982.

The goal of further development work on the catalytic coal hydrogenation process is the construction and operation of industrial facilities. In this, the Bottrop coal oil facility is a link in the required development chain for minimizing the technical and economic risks. The transition from this large-scale test plant to an industrial hydrogenation complex can be accomplished with the current design concept and a throughput scale-up factor of 1 to 12.5 is considered feasible.

Further Development of System Components Necessary

In addition to optimizing process parameters, testing and further development of plant components which do not reflect the state of generally available technology are focal points of the experimental operation of the Bottrop facility. Examples of such equipment items are sludge pumps, heaters and reactors used in hydrogenation.

High-pressure sludge pumps bring the coal/oil suspension up to the pressure required for hydrogenation. Due to the high solid content of the sludge, the pumps must meet stringent requirements to protect against abrasion. Three different high-pressure piston pumps have been installed for evalutaion in the Bottrop plant. Each pump has three parallel pistons. In two pumps the pistons are arrayed vertically; in the third, horizontally.

In the pumps the valves are opened by oil columns supplied with fresh oil, a portion of which is lost and must be replenished during each cycle of the piston. This type of hydraulic actuation permits abrasion-free piston operation.

During heating the coal strongly absorbs the solvent. In this gel phase the viscosity of the coal/oil suspension increases whereas it should actually decrease with increasing temperature. It reaches a maximum at 300 to 350 degrees C and only then decreases, falling off sharply aided by the onset of the chemical decomposition of the coal. In the region of high viscosity, heat transfer degrades substantially due to laminar flow increasing the coking tendency. For this reason, special attention must be given to designing the peak heater. Two different types of peak heaters, a rolling gas and a radiant heater, were installed in the Bottrop plant.

In the case of the rolling-gas heater, heat transfer is by convection produced by blowing hot combusion gases across a row of connected hair-pin-like tubes which carry the coal/oil suspension. The heat transfer efficiency is relatively low, minimizing the coking propensity of the coal/oil suspension in the hair-pin tubes. Disadvantages of this type heater are its size and cost. The danger of coking is greater in the case of radiant heaters due to the higher temperatures produced. The reduction of this risk through use of higher heat tranfer values, smaller size and lower investment cost is the objective of the operational tests in the Bottrop installation.

The hydrogenation reactors are multilayer containers which for reasons of cost are provided with internal insulation. This insulation is protected from solid-material erosion by the coal/oil mixture by a thin-walled metal shell. During operation gas, especially hydrogen, penetrates from the reactor chamber into the space behind the metal shell and into the insulation layer, filling all cavities at operational pressure. In order to ensure that the gas flows back into the reactor chamber when pressure is reduced, the metal shell is provided with pressure equalization ports.

Although pressure equalization in the insulation layer is accommodated during gradual depressurization, this is not true during rapid depressurization and

an over-pressure condition can develop in the insulation layer which can cause mechanical deformation of the metal shell in the reactor cavity. Depending on the degree of deformation, the internal insulation can come loose with the result that the pressure-bearing multilayer external shell is no longer insulated at all points. In order to prevent local overheating of the reactor pressure vessel during subsequent operating cycles after the insulation has failed. the reactor has to be removed from service and the internal insulation along with the internal metal shell must be replaced. A new type of reactor is being developed which does not exhibit this disadvantage due to pressure cycling, especially upon depressurization. Thus it promises the have high availability and a long service life. An important feature of this development is a pressure-bearing metallic support shell between the insulating material and the reactor chamber. Installation and testing of this type reactor is planned at Bottrop.

Feasibility of Large-Scale Coal Hydrogenation Investigated

The construction of production facilities is technically feasible; however, their operation is presently uneconomical. This is a conclusion from the pilot project "Large-Scale Coal-Oil Facility, Ruhr" for the construction and operation of a large-scale installation for the production of coal oil by a catalytic process which was accomplished under a contract from the Minister of Economics, Infrastructure, and Transportation of the state of Nordrhein-Westphal.

The Large-Scale Coal-Oil Facility, Ruhr was designed as a complete hydrogenation plant with all required ancillary and material refining installations. The intended conversion material is an open-burning coal of the Ruhr region. The design takes into account that the composition of the conversion coal will vary over the ranges listed in the specification of Table 1.

Possible locations for constructing the large-scale plant lie in the Ruhr district where an adequate transportation infrastructure is in place. Plans call for continuous plant operation 330 days per year.

The pilot project of Ruhr Coal AC investigated plants with coal throughputs of 3.3 and 6.6 million t/y of water-and-ash-free hydrogenation coal for the production of 1.5 and 3 million t/y of light and medium oil. This corresponds to daily throughputs of 10,000 and 20,000 tons of water-and ash-free hydrogenation coal. The plants have two and four hydrogenation lines, respectively. The resulting gasoline price from large-scale plants of this type is DM 2.09.

Even though commercial coal liquefaction plants are not yet economical, advantage should nonetheless be taken of the present "breathing room" in energy markets to further develop coal hydrogenation technology. For this purpose, a technically and financially realizeable plant with a daily throughput of 2,500 tons of water-and-ash-free hydrogenation coal could serve as a reference facility using commercial plant components.

Mentioned in conclusion is the economic importance of commercial facilities for employment, technical innovation and development of alternatives to OPEC dependence.

Saar Plant

Graefelfing ENERGIE in German Jun 82 p 171

[Article by R. Thomas and H. Wuerfel*: "Coal Liquefaction Will Grow Into Profitability"]

> [Text] Of the three studies reported relating to the economic feasibility of coal liquefaction in the FRG, that of the Coal Liquefaction Company, in which the Sar Mining Company and the BP subsidiary Gelsenberg participate on a 50-50 basis, produced the "most satisfactory" results. For the Saar coal gasoline, a pump price of about 2 DM/l would cover operating costs. The differing results of the planning studies may be due only in part to differences in the processes investigated; they are possibly due also to different methods for calculating economic performance. But also the Saar study, which was carried out with primary support from the BMFT, shows the same trend of the other studies: A large-scale facility for coal hydrogenation can only be realized by the injection of public funds.

In 1974 the Saar Mining Company AG undertook the further experimental development of the proven IG Farben process for direct liquefaction of coal. On this basis, a process concept for a large-scale plant for producing gasoline from hard coal was worked out and in 1980 BASF was contracted as general engineer to conduct additional engineering work related to optimizing this process concept. The "Planning Study" which was submitted to the Coal Liquefaction Company in installments was completed at the end of 1981.

Super Gasoline from Coal with a Pump Price of 2 DM/l

The planned facility has a coal conversion capacity of 1.9 million t/y. As an additional hydrogen source, 0.26 million t/y of coking plant gas is used. For producing a super gasoline which complies with specifications, 0.17 million t/y of blending components are necessary which must be bought. The hydrogenation facility's 150-MW electrical power requirement will be covered from an outside source.

From the raw materials, 1.3 milltion t/y of products will be produced, specifically:

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*Dipl Betriebswirt Dipl Hdl Reiner Thomas Business Manager; Dr Ing Dipl Ing Helmut Wuerfer Business Manager, both of the Coal Liquefaction Company, Saarbruecken

--0.9 million t/y of super gasoline (0.73 t/y of coal gasoline and 0.17 t/y of blending components)
--0.1 million t/y of liquid gas
--0.3 million t/y of synthetic natural gas.

About 1,500 employees will be required for administration, operation and maintenance. The space requirement is about 115 hectares. Considering the amount of research and development work still required, the earliest possible completion date for the large-scale facility is 1989.

The sump phase of the hydrogenation facility is a two-line design and works at a maximum pressure of 300 bar. The facility is thermodynamically so optimally designed that no preheating oven is required for heating the coal sludge. Further processing of the sump-phase coal oil into gasoline is accomplished in a single-line process using the same steps as in the petroleum industry: refining, hydrocracking and reforming. The hydrogen requirement will in general be covered by gas from a coking plant.

The hydrogenation facility is believed to be certifiable under the applicable environmental regulations. Emission projections based on propagation calculations show that the allowed emission levels--including existing preloading--will not be exceeded during plant operation at the Saarland sites studied.

The investment requirement for the hydrogenation plant in 1981 money is DM 2.8 billion. Projected taxes and interest during the construction period plus start-up costs increases this amount to 3.4 billion. Economic feasibility calculations based on present costs and taxes show that a pump price of about 2 DM/l will have to be sought to cover operating costs.

The future competitiveness of coal oil products will be largely determined by the relative price developments between coal on the one hand and the competing petroleum products on the other. In spite of many prediction uncertainties in the energy sector, it is assumed that in the long run the price of petroleum will increase faster than the price of coal and that the liquefaction of coal will eventually become economical.

Hydrogenation Technology Must Be Tested in Large-Scale Facilities

If the modified hydrogenation technology which has not yet been tested in large-scale facilities is to be demonstrated in prototype facilities soon enough to present an option on the way "away from oil" and to ensure German industry's lead in this technology, then development and construction of prototypes has to be undertaken today in spite of the fact that profitability is not yet assured. However, this can be done by private business only with appropriate support from governmnet.

Veba Oil Plant

Graefelfing ENERGY in German Jun 82 pp 172-173

[Article by G. Escher and H. Hosang*; "Coal Oil, a Subsidy Business"]

[Text] It takes 20 volumes to hold Veba Oil's preliminary study on the realization of a large-scale hydrogenation plant in the FRG. Involved in considerations of method, economic feasibility, environmental compatability and site selection were the firms Lurgi, Linde, Veba Power Ruhr and Huels Chemical company. The study, which cost DM 12 million (half paid by the BMFT) came to the conclusion that the hydrogenation of coal will not be economical in the foreseeable future without public subsidy.

From 1936 to 1945 hard coal was being converted into liquid hydrocarbons at the Schloven and Horst plants which today belong to Veba Oil. Hydrogenation was accomplished in two steps, the sump phase and the gas phase, with intervening complete condensation and expansion of the raw products (Bergius-Pier process).

After slight modifications to these facilities which were built for coal hydrogenation, petroleum residues were hydrogenated in the period 1952 to 1964. This led to the development of a process which is known today as Veba-Combi-Cracking and in which the direct combination of both hydrogenation processes is realized. This process was carried over to coal hydrogenation and forms the basis of the feasibility study.

For the large-scale facility, four parallel hydrogenation lines are provided. Hydrogen production is accomplished via three parallel gasification installations and one cracking unit in which a part of the C_1/C_2 gas resulting from hydrogenation is used. Through the multiline design of the most important sub plants, high availability of the overall facility can be achieved. Even though all four hydrogenation lines are basically planned for the use of coal, two of them were designed so that heavy oil can also be used.

This combined design has the following advantages:

--Flexible operation corresponding to the market and cost situation of the raw materials,
--Distinctly lower operational losses than in a pure coal hydrogenation plant,
--Contribution to further refining of conventional petroleum through conversion of the heaviest refinery residues into fuels, light heating oil and chemical raw materials,

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*Dr Gerd Escher, Business Manager; Dipl Ing Hans Hosang, director of coal conversion, Veba Oil Development Company mbH, Gelsenkirchen

--Instant availability for 100-percent coal throughput, for example in times of crisis.

From 4.3 Milltion Tons of Coal, 1.7 Million Tons of Gasoline per Year

Using 4.3 million tons of coal per year, the overall facility will produce about 1.6 million tons of gasoline and light heating oil per year as marketable finished products. By using top residue (an example of operating with heaviest oil) vacuum-gas oil is extracted from one of the hydrogenation plant's prestage vacuum distillation units. The remaining vacuum residue is converted into light hydrocarbons in the hydrogenation unit. Since in this case the hydrogenation unit in particular can be more highly loaded, additional syncrude is produced which along with the vacuum-gas oil can be further processed into finished products in available outside refineries.

Within the scope of the study, a total of ten locations were investigated, five inland and five on the coast. In the Ruhr region the Rheinberg site is well suited due to its favorable infrastructural connections. The same holds basically, in spite of several infrastructural disadvantages, for the Dortmund-Ellinghausen location. Brunsbuettel is regarded as a favorable location on the North Sea coast.

The realizability of the facility at all locations is not assured politically. Public resistance has the potential to significantly delay, if not to stop construction altogether.

Applicable Environmental Protection Regulations are Met

The plant can be built and operated within the scope of the applicable environmental-protection regulations. For gaseous and particulate emissions, the requirements of Technical Guideline, Air (TG, Air) are not exceeded. This may however become questionable in view of the clearly more stringent authorization conditions which could result from the present discussions of the proposed changes to TG,Air.

Noise emission can be held within the limits prescribed by TG,Noise by applying special protective measures which, of course, go far beyond the present state of technology. Waste water from the process will be subjected to multistage biological processing after recovering phenols and ammonia. The granulate resulting from gas..ication of the residue has a closed surface and is considered neutral in its effect on ground water at waste disposal sites.

Economic Feasibility Not Seen in Foreseeable Future

The cost estimate showed an investment of DM 6 billion (in 1981 DM); through interest and taxes during the 8-year construction phase, the total capital at interest increases to about DM 7.7 billion.

The use of German coal generates an annual subsidy requirement of about DM 1.4 billion. This calculation holds for a gasoline price of 1.50 DM/l and

a light heating-oil price of 0.75 DM/l (status of October 1981). Neglecting subsidies the pump price required to cover costs is 2.20 DM/l for gasoline and an associated heating oil-price of 1.61 DM/l. By using imported coal the annual subsidy requirement decreases to DM 1.1 billion. Without subsidies the price for gasoline is 2.05 DM/l and for light heating oil, 1.45 DM/l.

If two lines of the hydrogenation plant are supplied with heaviest oil, then the annual subsidy drops to about DM 0.9 billion with use of German coal (1.92 DM/l for gasoline, 1.36 DM/l for light heating oil) and to about DM 0.8 billion with use of imported coal (1.85 DM/l for gasoline, 1.28 DM/l for light heating oil).

For the production of gasoline exclusively from German coal, the subsidy requirement increases to about 1.5 billion DM/y. In this case the gasoline price amounts to 2.37 DM/l including all taxes and distribution costs.

Overall, the study shows that the hydrogenation of German hard coal alone and in combination with heaviest oil using the Veba Combi Cracking process (a further development of the Bergius-Pier process) is realizeable on a large scale in Germany. This still holds even when environmental-protection requirements are included. The amendment of TG,Air which is presently under discussion would distinctly tighten the authorization conditions and additionally--possibly greatly--complicate the realization possibilities of the project.

The facility requires a relatively large tract of land and good transportation connections so that realization is possible at only a few locations in the FRG. Basically, however, locations are available at which the facility can be built even taking into account existing emission pollution levels if local resistance can be defused. A large-scale installation of this type serving as a reference facility would bring significant advantages to German industry. However, the absence of profitability today and in the foreseeable future does not allow this project to be realized in the private economy under conditions prevailing today.

9160
CSO: 3698/26

ROBOTICS COMMISSION MAKES RECOMMENDATIONS FOR CATCHING UP

Paris ELECTRONIQUE ACTUALITIES in French 3 Sep 82 p 4

[Article: "Robotics Commission: Nine Proposals for Catching Up."]

[Text] The Robotics Commissions conclusions which its leader, Mr Petiteau (chief executive officer of Sormel and Jaz Industrie, in the Matra group) placed on the desk of the minister of research and industry in July will serve as a basis for the production plan initiated by the minister. The declared objective is "to give France competitive robotics industry performing in the domestic and foreign markets, making it independent of the principal industrialized countries."

An ambitious objective if one considers the rather negative observation taken from the commission report: the imported share of the domestic market, a market estimated at over 8 billion francs in 1982, reaches an overall 65 percent for all automation. The most disturbing figures concern CAO [Computer Assisted Design] (90 percent of the market controlled from abroad, systems (80 percent), industrial calculators (60 percent) and the so-called "advanced design" machine group (60 percent). Finally, it is robots again which are the least unfavorable to national industry with a planned import rate for 1982 of 50 percent. The situation is characterized by the number of flexible automated shops operating in France: 2 (and about 10 projects) compared to 50 to 100 in Japan, 50 in the United States and 70 in the FRG. There are, however, some positive points which are decisive trump cards: a very high level of research and a first-rate service and engineering industry, for example.

In order to catch up quickly, the commission estimates the investments required over three years at 2.4 billion francs (compared to 500 million francs invested for the past 3 years). The commission views that sum as not very large considering the expected gains in productivity, on the order of 10 billion francs, for industries downstream.

Regionalization

Nine proposals have been set out:

--The creation of an Interministerial Robotics Committee (CIR) which would broaden the functions of the CODIS [Steering Committee for Development of Strategic Industries], coordinate all activities and manage the funding

allocated. However, let us note that this proposal has little chance of being accepted, the functions of such a committee should rather being encompassed in a broader structure within the production plan.

--Establishment of competent regional centers around existing structures (ADEPA [National Agency for the Development of Automated Production]) engineering schools, laboratories, technical centers, builders and users. The first two such centers will be Besancon, with a specialization in light robotics and perirobotics and the planned creation of an Institute for Automated Production, charged at the national level with the qualification of components; and Toulouse, with the launching of a structure called Midi-Robots, charged with the coordination of developments with a strong computer and software component. The financial resources recommended for the two centers: 75 million francs a year. Other centers could follow at Nancy, Strasbourg, Aix, Marseille, Tarbes and Nantes.

--Five subjects of priority research will be instituted: automation and advanced robotics, continuation of the ARA [Automation and Advanced Robotics] project with emphasis on artificial intelligence (proposed budget: 80 million francs over 3 years); components (150 million francs over 3 years) with emphasis on probes, motorization and kinematics; study of the social and economic consequences of automation (5 million francs), automation of continuous processes (20 million francs); the fifth theme would treat the relationship of robotics to other disciplines, data processing, electronics (developments of specific integrated circuits), mechanics (the machine tool plan) and optics, around the use of the laser, 45 million francs being devoted to these activities.

--Pilot operations in the area of flexible shops would be set up. The activities proposed are: small electrical motors for the automobile, electronic cards and circuits, assembly of electrical components, and soon. Budgetary provisions would be 258 million francs.

--Specialized training within existing establishments (30 million francs over 3 years).

--Creation of new information and promotional circuits, starting with existing organizations (AFRI [French Association for Industrial Robotics], SEE [Electronics and Electrotechnical Company], ISF [expansion unknown], AFCET [French Association for Economical and Technical Cybernetics]).

--Implementation of qualification procedures and development of standards (60 million francs).

--Creation of new relay structures with the reinforcement of regional centers of the ADEPA [Association for the Development of Automated Production] and the help of the creation of the Society for Robotics Services and Advice (SSCR). Proposed budget: 120 million francs over 3 years.

--Implementation of a financing structure with extension of funding accorded by the ANVAR [National Agency for the Promotion of Research], the ADI [Computer Development Association] and within the framework of the MECA [Advanced-Design Machines and Equipment] procedure. This funding should "consolidate the automator and the automated."

9969
CSO: 3102/455

ROLL-OUT OF SAAB-FAIRCHILD SF-340 IN LINKOPING

Zurich NEUE ZUERCHER ZEITUNG in German 30 Oct 82 p 7

[Text] King Carl XVI Gustav pressed the legendary button; the lights in the enormous hanger went out; trumpet fanfares, drum rolls; the curtain rose slowly to reveal the brightly lighted star of the ceremony: the Saab-Fairchild 340, the 34-seat aircraft for regional air transportation, with the Swiss cross on the tailfin and the Crossair name on the fuselage; from the spectators' perspective it could not be seen that the aircraft was painted on the other side in the colors of Air Midwest, the first customer from the United States.

About 500 guests from all over the world had come to the Saab-Scania aircraft works in Linkoeping in the central Swedish province of Oestergoetland for the roll-out ceremony; in the various speeches the main emphasis was on the importance of the Swedish-American cooperation, which Saab-Scania and Fairchild-Swearingen had decided on in 1980. Their project took shape in the remarkably short time of just under 2 years. The maiden flight is set for January 1983, and delivery of production aircraft is to begin in spring 1984. Crossair, which has ordered 10 SF-340's and has a one-tenth share of the current orders of about 100 aircraft, will receive the first one.

In The Updraft of Regional Air Transportation

In the last few years, regional air transportation has been in the grip of a powerful updraft. In the United States, where it was already extremely widespread, its development has been additionally favored by deregulation, and in Europe the need for this type of connecting flight has grown in large part because the major airline companies were forced to neglect them for economic reasons. Their smallest airplanes, the Boeing 737 and the DC-9, with 100 and more seats, are too large for the sparse volume of traffic away from the main air travel arteries, which normally are most active between the most important economic centers of the individual countries. For this purpose a smaller aircraft was required, with the appearance and comfort of a "real" passenger aircraft. The Fairchild-Swearingen Metroliner, for example, as used by Crossair, met these requirements to some extent. But, with 18 to 19 seats, it is already too small for certain regional air traffic routes.

In light of this situation, the construction of larger turboprop aircraft became more urgent. It was as obvious for Fairchild, following its good experience with the Metroliner, to turn to these types of plans as to form an alliance with a Euro-

pean manufacturer. At the time, Fairchild had built more than 200 Fokker F-27/227 Friendship aircraft as a licensee. What was more astonishing was the energetic activity in a civilian area of Saab of Sweden, which has made a name for itself up to this time almost exclusively with its military aircraft--the Draken, Viggen and, in the future, the JAS 39.

Economy in Capital Letters

The Saab-Fairchild 340 is a cleanly shaped small passenger aircraft; the fuselage, wings, engine and cockpit equipment conform to the most advanced state of technology. The cabin offers space for 34 passengers in 11 rows of seats--10 rows of 3 and, at the very rear, 4 seats in a single row; with a height of 1.83 ms, it will not force either the passengers or the stewardess, who will be part of the crew of the SF-340, to adopt a "necks-bent attitude" in the center aisle. The two turboprop engines (General Electric CT7), each with an output of 1,630 SHP [shaft horsepower], give the aircraft a cruising speed of about 500 kms/hour and are commended as being particularly quiet. With respect to fuel consumption in general, the SF-340 is said to be superior to every aircraft in a similar size category. The range covers an area of 1,500 kms.

Basically, Fairchild builds the aircraft's wings and the tailplane, Saab builds the fuselage. Final assembly takes place in a giant hangar in Linkoeping, which was built from scratch in just a few months. Almost one-half of the approximately 100 orders come from the United States. In 1984, 24 SF-340's will be delivered, in 1985, 43, and about 50 in 1986.

An Important Day for Crossair

With its order for five units and an option for another five--they have now been changed to firm orders--Crossair provided the initial spark for the construction of this aircraft in November 1980. Their plan requires investments in the magnitude of $ 50 million. Crossair was able to negotiate particularly favorable terms as the "launching carrier;" it was suitably honored at the roll-out ceremony in Linkoeping. Director Moritz Suter paid tribute to the event in a cleverly worded speech; at its conclusion he and Crossair's administrative president, Dr Alfred Wiederkehr, gave the Swedish king a Crossair share as a present. The Swedish royal house is, therefore--at the moment at least--financially involved in Crossair; there is no reason to suppose that the name will subsequently be altered to "Royal Crossair."

There was state representation from Switzerland in attendance at the ceremony in Linkoeping. Crossair had chartered a CTA Caravelle for the occasion. Among the guests were members of the executive or legislative branches of the cantons of Basel, Tessin, Bern and Geneva and the cities of Lugano and Zurich and the director of the Office of Civil Air Traffic, Rolf Kuenzi; Swissair was not represented.

9581
CSO: 3698/47

ALL 1983 SAABS WILL HAVE NEW NONASBESTOS BRAKE SYSTEMS

Oslo AFTENPOSTEN in Norwegian 14 Sep 82 p 12

[Article by Are Wormnes]

[Text] The Saab factory will be launching something no one else has been able to come up with and that the Mercedes engineers called impossible on all its 1983 models: semi-metallic, nonasbestos brakes with better braking properties and a lifetime 3 to 4 times as long as that of standard braking systems.

This little Swedish car factory, which competes with the giants of the car market, has a certain talent for coming up with technical and safety innovations. Some past accomplishments are "collision-proof" bumpers, headlight wipers, a heated driver's seat and gasoline turbo engines. Many of the big companies have since followed suit, but Saab is still one of the smallest companies.

What is so special about nonasbestos brakes? Saab's testing chief for car bodies and brakes, Magnus Roland, told AFTENPOSTEN that 6 years of development and testing as well as a couple of lucky accidents lie behind the introduction of the new brakes--which can also be installed on older models. "Mercedes tested the device but could not use it on its brake systems. They said it was impossible to use metal fibers to replace asbestos. The brakes heated up too much. Saab solved these problems and can therefore offer an environmentally acceptable braking system with better braking properties and a lifetime 3 to 4 times as long as that of an ordinary system--we estimate it as being from 70,000 to 90,000 kilometers," he said.

Roland claimed that Saab has produced brakes that give maximum efficiency in all kinds of road conditions. "The braking efficiency is distributed between the front and back wheels with an automatic adjustment to the surface, without using valves, giving the shortest possible braking distance," he said.

Roland is convinced that competitors will follow them in this area too, but that it will take several years before they manage to do so. "They must make too many changes in their existing designs," he maintained.

6578
CSO: 3698/55

END

JPRS 82407

7 December 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 129

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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JPRS 82407

7 December 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

No. 129

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BRIEFS

ITALIAN BIOTECHNOLOGIES PLAN--Italian scientific research minister Giancarlo Tesini has announced a five-year plan for the promotion of biotechnology. The plan calls for expenditures amounting to 128 billion lire, of which 76 billion lire are to be supplied from the funds based on Law 46 on Technological Innovation. The remaining 52 billion lire are to be financed by private industry. The National Research Council will make an additional 13.5 billion lire available for research projects in this field. The plan is designed to guarantee not only follow-up projects for the work of the CNR (National Research Council), for which the latter has already provided 18 billion lire, but beyond that, it is supposed to provide incentives for technological innovation in the fields of chemistry, electronics, metal processing, and medicine. [Text] [Duesseldorf EUROPA CHEMIE in German 19 Aug 82 p 390] 5058

FRANCE AIDS BIOTECHNOLOGIES--The French government continues to assign great importance to biotechnology as one of the seven "brood mares" of the government research and innovation program. As we can tell from the recently submitted 3-year program, about 40 major projects are to be promoted in this field which is highly important for the future. Some of these projects deal with basic research in the area of enzymes, microorganisms, as well as animal and vegetable cells; others deal with biological methods which so far have been neglected in France, such as cell breeding, development of bioreactors, as well as separating and purification methods. Last but not least, research projects oriented toward practical application are also to be promoted; they deal with the production of chemicals, medications, and food products as well as environmental protection aspects. The comprehensive program is supplemented by the training of experts as well as the transfer of knowledge to industry. The public is to be familiarized with biotechnology and objections are to be explained through a broad publicity effort. France is to spend Frl.1 billion for the above-mentioned projects this year. In 1983, the figure is to be Frl.4 billion. Most of this money will be supplied by industry. By 1990, French biotechnology production is to amount to 10 percent of the world market which currently has been given at a figure of Fr250 billion. [Text] [Duesseldorf EUROPA CHEMIE in German 7 Aug 82 p 372] 5058

CSO: 3698/42

BRIEFS

FUNDS FOR CHEMICALS INDUSTRY--About half of the Fr9.9 billion, which the French government is making available to nationalized industrial enterprises in 1982, goes to the chemical industry. The lion's share of Fr2.4 billion goes to the "Pechiney Ugine Kuhlmann SA" nonferrous metal concern. Furthermore, Fr1.26 billion have been set aside for "Rhone Poulenc SA and Fr400 million were earmarked for the "Cie de Saint-Gobain SA" glass and tube concern. "CdF Chimie SA" is to get Fr600 million and its affiliate, "Entreprise Miniere et Chimique SA" will get Fr200 million. The flow of money fell considerably below the expectations of the enterprises because fund requests had to be cut back drastically on account of the heavy budget deficit. About Fr3 billion are in each case contributed out of the total sum as capital pump priming operation by the government to the government-owned National Investment Company as well as in the form of partnership loans.An amount of Fr350 million has been set aside for new projects. [Text] [Duesseldorf EUROPA CHEMIE in German 7 Aug 82 p 372] 5058

CSO: 3698/42

ENERGY

SPAIN, FRG TO BUILD WORLD'S LARGEST SOLAR POWER PLANT

Madrid EL PAIS in Spanish 25 Oct 82 p 62

/Article by Antonio Fernandez Gil/

> /Text/ Almeria--Luis Magana Martinez and Jose Maria Fluxa Ceva, on behalf of and representing the CEE (Center for Energy Studies) and the ASINEL (Association for Industrial Electrical Research), respectively, signed a cooperative agreement Friday. In principle it is for 1 year, but it may be renewed for a period of 1 year at a time until completion of the technological development program (GAST), foreseen for 1985. The program is being carried out at the Tabernas solar platform (Almeria).

The GAST project is represented by the model of solar installations with a central tower, whose utilization makes possible the production of electricity through the convergence of thousands of luminous beams on a mirror called a heliostat. By virtue of the agreement just signed, the solar platform at Almeria will soon begin the experimental testing of critical components for the development of the GAST project, for which the Governments of Spain and the FRG will construct a 20,000-megawatt solar power plant in our country, with a total investment of more than 20 billion pesetas.

As is known, in Almeria there is already an operational solar power plant programmed by the International Energy Agency, which is currently developing the project Small Solar Power System, generating 0.5 megawatts of power. And functional tests will soon begin for the Almeria Solar Electric Power Plant (CESA-1), a 1.2-megawatt project administered by the CEE.

Management and coordination of the project will be the responsibility of ASINEL, which will also be responsible for construction, operation, maintenance and evaluation of CESA-1, as well as the customary services of health, security and cleaning of the solar platform.

For its part, the CEE will provide ASINEL sufficient space for the GAST installations, also facilitating the use of the CESA-1 infrastructure under the principle of mutual cooperation without interference between the two projects.

For the signers of the agreement this act represents a very important step not only to test the viability of power plants of this type, but in developing a specific advanced technology. The electrical sector now reckons with the first solar power plant utilizing high-temperature gases at 1,000 degrees centigrade and with new designs for heliostats at 60 percent under their normal cost.

9746
CSO: 3698/45

BRIEFS

SPANISH PHOTOVOLTAIC POWER PLANT--Madrid--The largest photovoltaic solar energy power plant in the world will be built in the near future at Guadalix de la Sierra, near Madrid, and will have a power of 100 kw, according to the terms of an agreement signed on 30 July between the Ministry of Industry and several private firms. This solar power plant will be the first of its kind built in Spain and will cost 466 million pesetas (28 million French francs). Among the objectives of this project is the long-term installation in Spain of photovoltaic solar power plants that can rival the conventional energy sources from the standpoint of production cost. [Text] [Paris AFP SCIENCES in French 5 Aug 82 p 29] 9969

CSO: 3698/20

FRENCH RESEARCH FOURTH-GENERATION COMPUTER TECHNOLOGY

Paris L'USINE NOUVELLE in French 16 Sep 82 supplement pp 6-8

[Article by Jacques Antoine]

[Text] The limited market for big scientific computers--a few hundred machines--explains their near absence from computer exhibits such as the SICOB [Trade Industries and Office Management Exhibit]. But from these poorly known computers the fourth generation of computers will emerge--the supercomputers of the next decade.

Scientific applications require many more highly complex numerical calculations than do management or process control applications. "In the beginning, they worked with military problems, territorial defense and surveillance, ballistics, satellites, etc.," says Jean-Claude Syre, a staffer at the CERT [Toulouse Study and Research Center], an ONERA [National Office of Aerospace Studies and Research] facility. Now they are being expanded to some major civilian applications: meteorology, seismology, plasma physics, aero and hydrodynamics, resource studies, simulations of various large systems, etc."

These scientific applications demand programs whose processing time in our conventional computers is prohibitive. The time required is either incompatible with the problem to be treated--as is the case with real-time processing of satellite images--or with the average rate of failure of the computer system. "For NASA's Space Shuttle, for example, spending 50,000 hours in a wind tunnel is just not possible. So they have to break down the study by using computer simulations, after first dividing the problem into parts and simplifying the equations. Even then, a simulation still takes about 10 hours of computer time. NASA's goal is to bring it down to a quarter of an hour."

The power of an average computer of the present third generation, of the CII-HB 66/80 or IBM 370/158 type, ranges

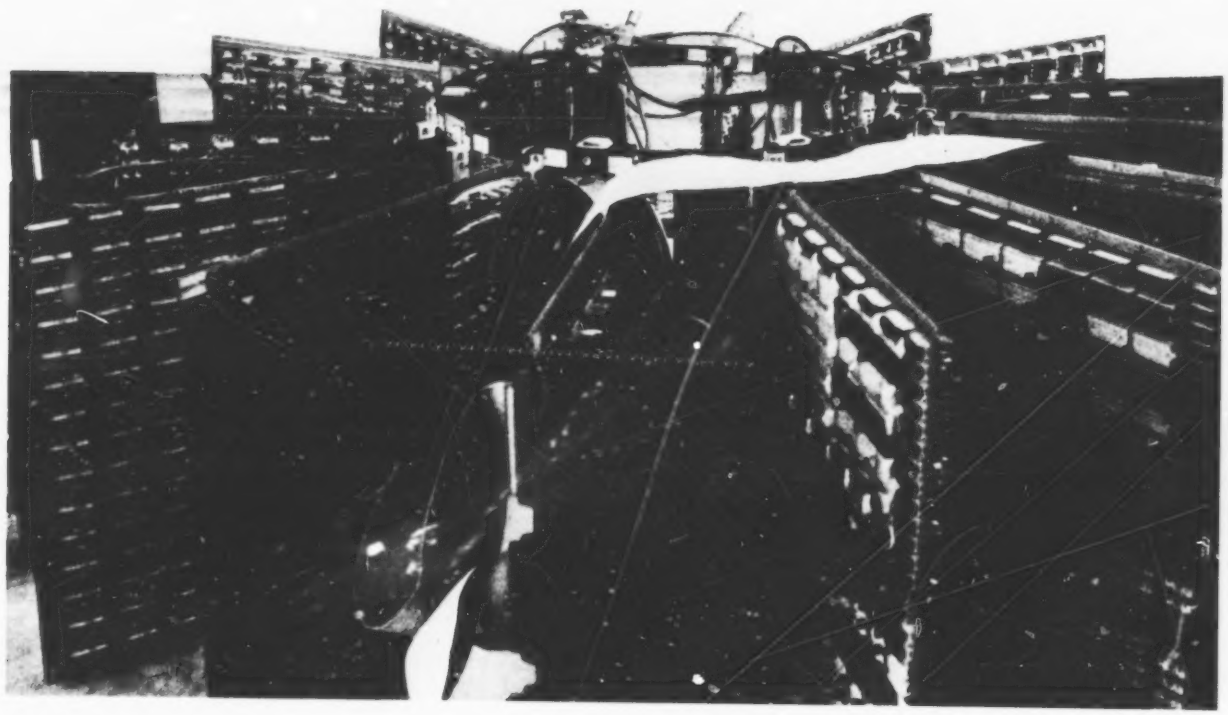
between 0.5 and 2 Mflops (megaflops or millions of operations per second). These essentially paltry performances are related to the monoprocessor architecture used for computers ever since their early days (this type of architecture is sometimes called von Neumann architecture). A corollary of this architecture is their sequential functioning. For these machines, the problem to be solved is translated into a sequential language of elementary instructions: either a Fortran, Basic, Assembly, or similar program. The machine reads these instructions one after the other and executes them, by issuing for each instruction a sequence of orders in the processing unit. Even if the processor and the central memory now use the same technology, which means they can be intimately integrated, it is still true that the limited speed of communication between these two functional entities will remain a fundamental handicap. "If we want to go a little faster, perhaps 5 to 10 times faster," said Jean-Claude Syre, "we can still rely on technology for semiconductors integration. And to go beyond that, up to now we have made strictly structural modifications, but not fundamental modifications in the organization of the computer."

Interconnected memories and pre-memory units are used to reduce the access time to the central memory. "We can also reduce the time of execution of an instruction by dividing it into different stages, each handled by sub-systems of the processing unit." Here we find an overlapping of the different operations, producing the "pipelined" structure of these computers. This is the type of structure used for the most powerful computers presently available on the market, such as the Amdahl 470/V6, the Control Data, CDC Star 100, the Cray 1, or even the Cyber 203. These machines can reach theoretical speeds of 100 to 200 Mflops. But in practice, they rarely exceed 10 to 50 Mflops, for outside the field of vector calculations in which they excel, they are machines like any others, just faster.

So we are still far from the 1,000 to 10,000 Mflops that the scientists will want within the next 10 years. What is the answer? "Technological changes to improve these monoprocessor systems will not be enough. We will have to use radically different types of architecture," explain the Toulouse specialists. This will bring in computers with several processing units (multiprocessor architecture), connected in parallel and working on the same program. "By sharing a big program among a large number of these units, we can decrease its apparent total execution time."

A first concept of this type has been developed, with the SIMD [Single Instruction-Multiple Data Stream] machines, or matrix computers of the Illiac IV type (64 processors in parallel), Staran, or, in France, the Propal 2 of Cimsa. Here each processor performs the same elementary operation as all the others, but each works on different data. Such high performance computers for vector operations remain generally underutilized, though, as the programs are not limited to such operations. In addition, the execution is still sequential. In short, according to the specialists, this is "an unsatisfactory long-term solution."

Now we will leave the area of machines available on the market, to move to the area of research and projects preparing for the fourth generation of computers. These are MIMD [Multiple Instruction-Multiple Data Stream] systems, in which different operations on different data can be executed simultaneously, no matter where they appear in the program. So there is an asynchronous stream of operations to be executed in parallel, coming from different parts of the program. This marks the end of the "sequential" type of system.



Prototype of the future MIMD-type supercomputers. In 1979 the Lau machine was the only one operational anywhere in the world.

Associating Several Processors Working in Parallel Operation

The Toulouse computer specialists explain that we have to abandon the conventional execution of a program operated by sequential instructions and turn to an execution mode determined by the data. So, no matter where the instructions may be in the program, the computer performs the associated operations as the operands are calculated, and thus become available. Contrary to what happens in a conventional computer, "this parallelism and asynchronism of execution require that each variable can receive only a single value during the execution of the program. This condition, known as single assignation, is the foundation of data directed programming." Inevitably, it will revolutionize--unlike the preceding approaches--programming methodology (algorithms, etc.) and will also require changes in programming languages: automatic translation, or even new languages.

The CERT group has demonstrated the feasibility of this new approach. With the financial support of the SESORI, which is today the ADI [Data Processing Agency], and the noteworthy assistance provided by Jean Gualino, a member of the World Computer Center in Paris, in 1979 this group presented its LAU [Single Assignation Language] system, the only MIMD prototype operational on a world level at the time, 3 years ahead of other groups, such as the one based in Manchester. This was a system with several processing units working in parallel (32 and theoretically unlimited in number), under the control of a single central unit. Then the system can include asynchronisms either between elementary actions (execution in parallel of independent instructions) or between two functions within the same job of a computational type on a grid with a program affecting the frontiers of different domains, and another inside.

Another MIMD system is now being prepared. "This one will have greater consequences in terms of materials and commercial outlets," says Jean-Claude Syre. This project will associate a number (10,000 or more) of processors, but this time they will be complete. Essentially there will be several computers, each with its own control unit, capable of working in parallel on different problems, or all working together on the same problem. With such machines, asynchronism can be taken to a higher level, for example, between two jobs done by the same program. "During aircraft simulations, the nose doesn't always have a great deal to do with the rear aileron. So we could do two calculations at the same time, by means of a synchronization on the frontiers." This is still in the project phase.

In France, research on such large systems is essentially supported by the DRET [expansion unknown], primarily for military requirements, and by the ADI. In addition to the CERT group, some universities (Compiegne, Nice, etc.), the IRISA [Data Processing and Random Systems Research Institute] at Rennes, and the INRIA [National Institute of Data Processing and Automation Research] are interested in the MIMD systems. In industry, last year the CII-HB began its Isis project for a SIMD vector system which would be its top of the line computer after 1985. CIT-Alcatel also seems to be getting interested in this area, through its subsidiary, Sintra.

In the United States, in 1977 NASA began its NASF [Numerical Aerodynamic Simulation Facilities] project, which has an ambitious goal: to reach 1 gigaflop (1 billion operations per second, using a shifting decimal system). Burroughs and Control Data responded to the call for bids. Burroughs chose a MIMD system, and Control Data stayed with the pipelined structure already used for its Cyber series. But it does seem that the program may be more complex than expected, for the initial date scheduled for completion of this project has been pushed back from 1985 to 1988.

The U.S. firm, Cray Research Inc., is also involved in this field with its Cray 2 which, based on what we know today, will be a MIMD quadriprocessor system using a technology incorporating further improvements. In relation to the present Cray 1 system (a monoprocessor with a theoretical capacity of 80 megaflops), the cycle time will change from 12 nanoseconds (billionth of a second) to 4 nanoseconds, and the company has annouced speeds 6 times higher for scalar operations (management type calculations) and 12 times faster for vector operations (scientific calculations). The expected completion date: within 3 years.

1 to 100 Billion Operations Per Second

Unlike the French and American research, which has been motivated primarily by numerical applications, the Japanese program is oriented more toward artificial intelligence. Last fall, the JIPDEC [Japanese Information Processing Development Center] announced with great fanfare a vast national program to develop fifth generation [!] machines between now and 1990. Included among the 26 topics for research and development, grouped in seven categories, are these data stream machines and other very high speed numerical supercomputers. The Japanese are working toward a goal of 1 to 100 billion operations per

second, using a shifting decimal system (1,000 to 100,000 Mflops). Right now this seems truly phenomenal! Is this just a publicity stunt on the part of the Japanese, as some computer experts said when the announcement was made? "Oh, I take them very seriously," said Jean-Claude Syre.

7679
CSO: 3698/29

PLAN TO SPREAD KNOWLEDGE, USE OF COMPOSITES TECHNOLOGIES

Paris LES ECHOS in French 29 Oct 82 p 8

[Article by J.M.: "ANVAR To Encourage Technology Transfer Between Large and Small or Medium-Size Enterprises"]

[Text] In the past two years, France has resolved to bet on composite materials. First stage: it encouraged the creation of production units (Elf-Toray and PUK[Pechiney-Ugine-Kuhlmann]-Hercules agreements for carbon fibers). Second stage: it is now trying to promote applications.

In line with this, ANVAR [National Agency for the Valorization of Research] has initiated a consultation on composite materials. It is intended to encourage small and medium-size enterprises to venture and contribute to the dissemination of this advanced technology throughout the French society.

Who would have believed 15 years ago that electronic chips would be used in everyday life and would become familiar to the public at large? Mr Maurice Allegre, director of DESTI [expansion unknown] at the Ministry of Research and Industry, likes to predict that the same will happen with composite materials.

Compared with previous ANVAR consultations, the formula used this time was original. A number of large enterprises--either composite materials producers (like Vetrotex, a Saint-Gobain subsidiary specializing in glass fibers) or large users of the new technology (Aerospatiale, Dassault, Bertin, SEP [European Propellant Co.], MATRA [Mechanics, Aviation and Traction Co.])--as well as technical centers (CETIM [Technical Center for the Mechanics Industries], CEMP [Plastics Materials Research Center]) and organizations involved in the development of these materials (CODEMAC [Committee for the Development of Composite Materials], G3F [expansion unknown]) have promised to help the small or medium-size enterprises interested in the rapid development of these new materials.

In the long run, this could result in a transfer of technology. Certainly, the large participating enterprises promised first to provide half a day of free consultation and advice on projects submitted by the small or medium-size enterprises.

ELF-AQUITAINE, TORAY SIGN DEFINITIVE CARBON FIBER AGREEMENT

Paris LES ECHOS in French 27 Sep 82 p 8

[Article by J.M.: "Carbon Fibers: Agreement Concluded Between Elf-Aquitaine and the Japanese Company, Toray"]

[Text] The first great French-Japanese alliance in advanced technologies, the definitive agreement between the Elf-Aquitaine group and Toray, the Japanese group, for the creation of a carbon fiber plant in the southwest of France has just been signed. The protocol had been concluded last April.

The two companies are creating a subsidiary in which Elf-Aquitaine holds 65 percent of the capital and Toray, 35 percent. A first production unit with a capacity of 300 tons a year is going to be built within the Lacq complex. It will go into service at the end of 1984 and will allow the creation of approximately 100 highly specialized jobs. The investment planned is 200 million francs.

As soon as the market justifies it, the capacity of the plant will be increased to 600 tons a year and a polyacrylonitrile unit (raw material for carbon fibers) will be added to it. This project will require an additional investment of 250 million francs.

This will be the realization of a plan launched by the previous government and taken up by the Socialist government in order to encourage the world specialists in carbon fiber to settle in France where the only production is that of Serofim (common subsidiary of Carbone Lorraine and Rhone-Poulenc), with a production of 12 tons a year.

PUK [Pechiney Ugine Kuhlmann] with Hercules

The Japanese Toray, a group with gross sales of $3 billion and employing 30,000 persons, has textile fibers as its primary activity, but for 10 years has been diversifying into carbon fibers where it has become the world leader. While negotiating with the Swiss company Ciba-Geigy in 1981, it had begun conversations with the French company Rhone-Poulenc, then with Elf-Aquitaine. A first project was drawn up between Elf-Aquitaine, Toray and the American company, Union Carbide. Despite the defection of the Americans, Elf-Aquitaine and Toray held out.

But they are not opposed to the subsequent negotiation of a technology transfer agreement... as long as the small or medium-size enterprises do not compete directly with them.

Actually, disseminating knowledge in this field is in everybody's best interest. According to Jean-Michel Yolin, director of chemical industries at the Ministry of Industry, it will make it possible "to reinforce the top of the line by developing the base." Nevertheless, the projects submitted will undergo critical examination.

There are risks involved; small and medium-size enterprises should not get involved unless they have sound financial and commercial bases. This should not be a flash in the pan, but the creation of an industrial fabric with a potential for the future.

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CSO: 3698/51

Does the result exceed the hopes today? The Pechiney Ugine Kuhlmann group has signed a parallel agreement with the American Hercules for the creation of a carbon fiber plant with a capacity of 200 tons a year at Pont-de-Claix by the end of 1981. So France will find itself with a capacity of 500 tons a year by 1983, while the national consumption scarcely exceeds 100 tons a year. The specialists remain convinced that the outlets for carbon fiber in the aeronautical, automobile and sporting goods industries are going to increase very quickly.

The Elf-Aquitaine group is clearly showing that it has no intention of ignoring fine chemicals. For the past 2 years it has placed composite materials on its research and development programs and is devoting a budget of 10 million to it. And today its communique ends with an opening: "This agreement marks the first step toward a cooperation between Elf-Aquitaine and Toray."

9969
CSO: 3698/20

TRANSPORTATION

COMPUTER-AIDED DESIGN WELL ADVANCED AT PEUGEOT

Paris L'ARGUS DE L'AUTOMOBILE in French 9 Sep, 16 Sep 82

[Article by J.P. Gosselin: "Computer-Aided Design at Peugeot. Part 1: Means Used and CAD Structure Design. Part 2: Finite Elements and Simulated Impact Tests"]

[2 Sep 82 p 28]

[Text] Computers: there is the fatal word!... Today, no automobile manufacturer will introduce a new model without announcing "that its essential characteristics--power, weight, fuel consumption--were optimized through scientific computer calculations."

Where? When? How? At what cost? On what computer? These are the questions we asked technicians at Peugeot, a group which always had a daring computer policy, to which it now owes to be a world leader. The answer of Peugeot engineers, Messrs Hamon, Germain-Lacour, Dion, Gonard, Gratadour--to whom we wish to express our warmest thanks--provide much-needed explanations on the techniques and means used to design and manufacture vehicles with steadily improved fuel consumption but with equal (or better) passive safety and a reliability comparable to that of their predecessors.

Increasingly Powerful

Historically, the creation of scientific computation departments at La Garenne, Sochaux (Peugeot), Velizy (Citroen), Carrieres-sous-Poissy (Talbot) dates back to the 1960's. The computers used then appeared incredibly powerful; yet, they would be outstripped by today's microcomputers. Nevertheless, they marked the start of an irreversible process: since then, engineers have kept expecting more from the machines... which were improved, and so forth. The race between the (computer-aided) technicians' brains and the computing power of computers will never stop and is the guarantee of continued progress.

At La Garenne, from 1963 to 1967, IBM 1410 computers were used; from 1965 until 1970, they were replaced by EAI 23IR analog computers that could easily handle integral calculus. In 1967, the IBM 1130 were introduced and, an unprecedented fact, remained in service until 1982. After 1967, the process was accelerated:

from 1968 to 1970, the IBM 360/50; from 1970 to 1975, the IBM 360/65; from 1975 to 1980, the IBM 370/158-3. As can be seen, Peugeot remained faithful to IBM, the American giant, and followed the development of IBM computers which its technicians have fully mastered. In 1978, the still more powerful model PDP 1170 was introduced, and two units installed. Finally, an Amdhal V8 was acquired in 1981; at the time, it was the most powerful scientific computer in the world.

This "superbrain" (which since then has been outstripped only by IBM's Cray 1) then became the center of a complex network connecting all the group's computers, including those of Talbot United Kingdom.

This V8 computer (of a somewhat special type!) can process 10 millions of instructions per second, store in memory several tens of gigabytes (10^9 characters): even working day and night, it is not too powerful to accomplish what is required of it. Relieved from all management operations (which would detract from its scientific computation programs), it is actually connected to the two PDP 1170 units at La Garenne, to the VAX 11/1780 at Velizy, as well as to a host of other smaller specialized computers.

The schema is therefore simple: operations that cannot be performed by smaller computers alone are programmed by them and forwarded to the next higher level (PDP and VAX) where they are either processed or transmitted to the V8 computer. In that case, the smaller computers prepare the work of the superbrain. However, operations at these three levels--specialized computers, medium-size computers, very large computer--is on file in the V8 unit; thus, the group finds itself endowed with a common data bank, especially for geometrical shapes and numerically-determined parts. Thus, the V8 computer installed Quai Andre-Citroen has become both the number-one computer and the file for anything created at Peugeot; according to experts, this very large computer is just barely adequate for the task, but Peugeot paid 15 million francs for it and cannot replace it with a larger one... that would be prohibitive. Still, the staggering cost involved remains "economical"; actually, the price paid for the V8 computer is about equal to the annual cost of leasing the previous very large computer, which was four times less fast and four times less powerful! Consider that a simple graphic station will cost 600,000 to 800,000 francs and that tens of them are needed; you will then have a better idea of the colossal investments required. What most people do not know is that investments are also required for programs, i.e. the instructions given to the machines so they can work fast and well. These programs, the software controlling the hardware (as computers are commonly called), are of vital strategic importance: any company can acquire a very large computer, but it is much harder to make it work intelligently.

The development of programs followed that of computers, and they became increasingly more performing. Without going into details, Peugeot had developed a program, SPACG [expansion unknown], at the same time as UNISURF [expansion unknown], the software developed jointly by Renault and Peugeot for vehicle designing. After breaking up with Renault, Peugeot continued to work alone on UNISURF and is now merging it with SPAC. In spite of this Herculean task, based on the experience acquired during years of operation,

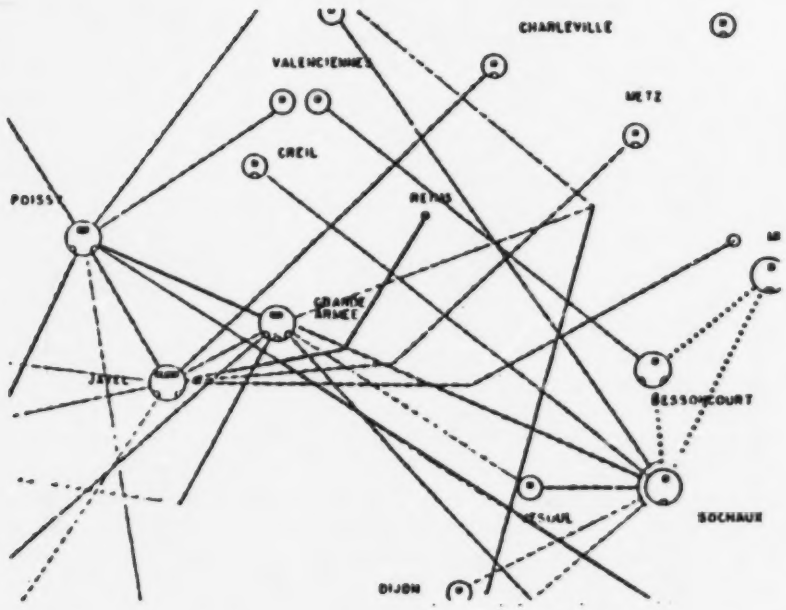

Figure 1. A (simplified and partial) view of the computer network created by Peugeot.

Peugeot is still purchasing software as it becomes available. For instance, NASTRAN (a program sold by NASA!) is perfectly suited for the V8 computer, which also contains the group's program library, preserving in its large memory software such as SPAC, UNISURF, PEG, SAM, etc.

In short, the development of programs during the past 20 years provides a good illustration of the prodigious acceleration of the process:

- In 1965, analog computations on the IBM 1410 could take into account 20-30 degrees of freedom; since each point of a mechanical part has 6 degrees of freedom, it is easy to see what a narrow range was imposed by this type of computer.

- In 1970, the Elvys numerical computation (on an IBM 1130) increased to 60 the number of degrees of freedom.

- In 1976, SAP finite elements (on an IBM 370-158) involved 1,500 degrees of freedom.

- In 1979, the large NASTRAN program (on the Amdhal V8) will integrate up to 20,000 degrees of freedom. We should not forget that a complete vehicle structure is often broken down into 2,000 nodes, i.e. 12,000 degrees of freedom.

Heavy investments, a relentless determination to design ever more powerful software, an impressive mobilization of "grey matter": computers must be extremely useful for automobile manufacturers to devote so much of their substance to them! As we shall see, computers have become absolutely indispensable...

CAD and Structures

CAD--Computer-Aided Design--and CAD/CAM--Computer-Aided Design and Manufacture --are often mentioned although we are not always aware of the revolution they brought about in vehicle designing: from beginning to end, the genesis of a vehicle, its shape, structure, various parts, are preserved in computer memories as numbers. Since these numbers can be instantly displayed on screen, we might think that we are working on drawings, like electronic blueprints, but it is not so. The structures which appear on the display are only the graphic representation of data and computations, and by correcting the drawing it is possible, if desired, to change the numerical data of a part!

It is easy to understand, then, that the numerical data which determine the future automobile constitute a wonderful "red thread" for all who will have to compute it, test it, make it reliable and manufacture it, as modern machine-tools operate directly from such numerical data! All we need is computers powerful enough to process this multitude of figures (which is why we see a scaling up of powers) and programs clever enough (they should not compute anything just for the sake of computing) to make a good automobile. Therefore, the theoretical advantages offered by CAD are that:

- within the same development time, it is possible to design a vehicle that will be lighter, stronger and more efficient than before.

- the quality remaining the same, it is possible to work much faster.

Today, the quality and continuity of software make it possible to say that not only vehicles are better designed, but the time required to design them and start production has been reduced by one year out of five (in the case of the Citroen BX).

As far as structure design is concerned, the first industrial CAD structures realized by Peugeot date back to 1969 for the Citroen Ami 8, and to 1972 for the Peugeot 104. Considerable experience has therefore been acquired. But how do they go about it? It all starts in the styling department where two models of the future vehicles are made, one for the inside, one for the outside. The structure is essentially based on the outside model, the dimensions of which are measured with extreme precision by an Alpha 3D machine. As its name indicates, the machine records the coordinates of the points which determine the "skin" of the car body along three dimensions.

The automobile will be created from this mathematically defined surface! The inner sheetmetal which will fit under the outer "skin" is then automatically designed by specialized programs (which must be highly efficient!). How, then, can it be ascertained that these elements will fit into the car structure? The car is designed (still by computer) in its outline, but can be modified later on to improve the overall design.

Thus, the outside shape is used to determine, by CAD, the shape of the inner sheetmetal, and this does not take much time; a windshield rim requires 1 day of CAD work, compared with 10 days "by hand." The same is true of the side-rack (an elongated structure located under the roof panel above the door openings). We could mention many more examples; the more complex the surface, the more time is saved: the displacement of a door needs 2 days of CAD, compared with 2 months "by hand." What about cost? Does it pay to use computers already at this stage? The center pillar of the Visa is estimated to cost 72,000 francs and 930 hours of CAD, compared with 120,000 francs and 2,160 hours "by hand"; these figures need no comments.

Similarly, internal parts will be defined numerically. This time, computations do not even have to be based on the outer "skin," but only on criteria of overall dimensions, operation, feasibility; with a well-developed program, this leads to direct design. For instance, based on a CAD description of the front-axle geometry, its drive-detent parameters, the steering desired, the tires, and other factors roughly determined (not defined) concerning the structure, the brakes, etc., it is possible to design the whole structure of a side of the engine compartment.

Graphically, the "reasoning" of the computer is easy to follow: from a simple diagram, it computes and immediately displays all the possible positions of the wheel (in all, even the worst possible, cases), installs the suspensions at the best possible places (taking the basic styling into account), computes

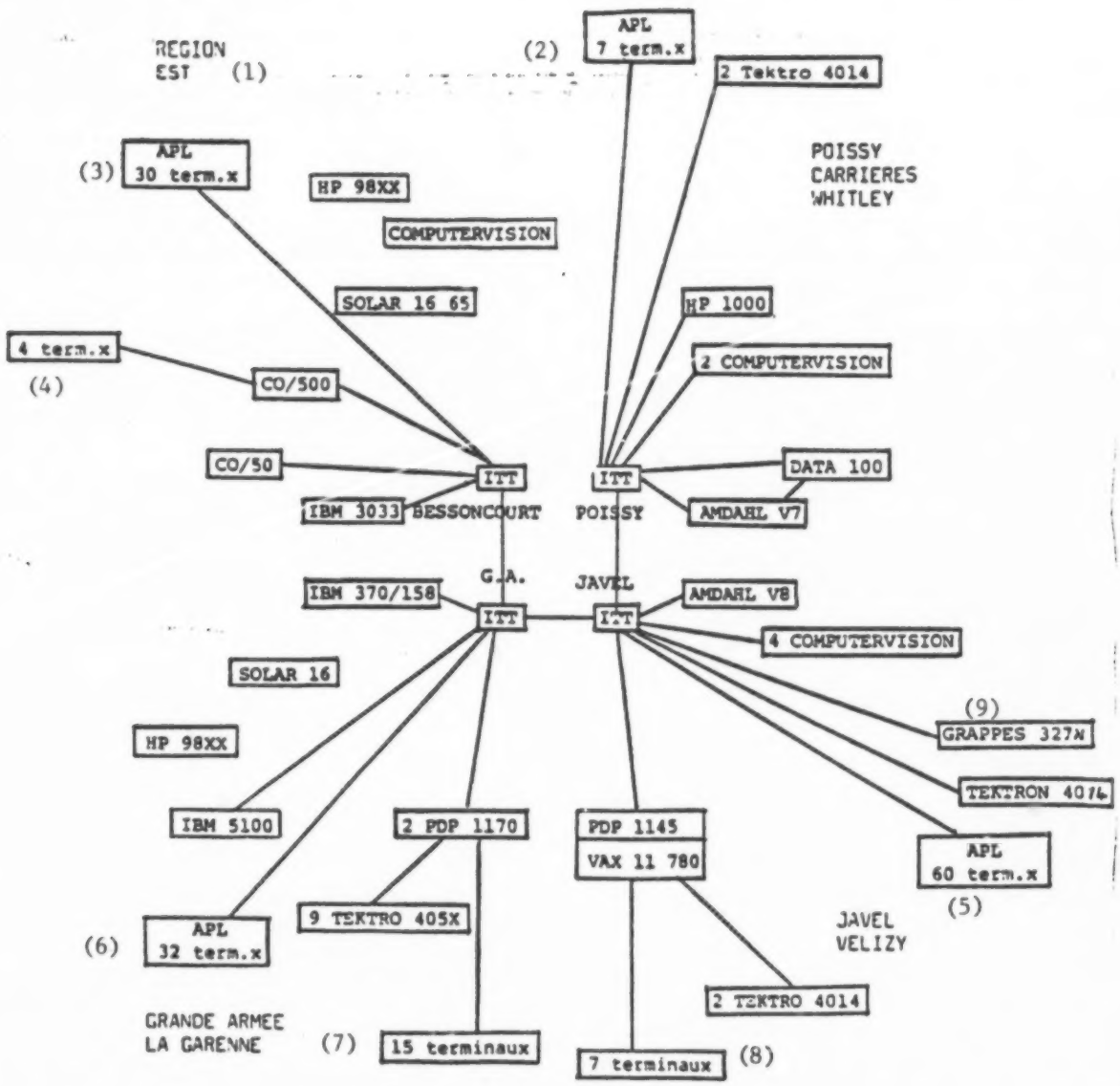

Figure 2. This (simplified) network was that of Peugeot until 1981. Since then, it has been increased and perfected. You will note the variety of equipment used, their high degree of specialization and the fact that they are connected to the Talbot U.K.'s network.

Key:

1. Eastern region
2. APL - 7 terminals
3. APL - 30 terminals
4. 4 terminals
5. APL - 60 terminals
6. APL - 32 terminals
7. 15 terminals
8. 7 terminals
9. 327W clusters

the shock-absorber cup, the wheel well (the technician can make changes on the screen with a magnetic pen) before designing the side rail... The intentions of the designer--as summarized in the specifications--are thus magnificently and quickly materialized. Each part thus created is filed (as blueprints used to be) in a memory level and can thus be superimposed on another; it is thus possible to stack up 256 magnetic blueprints, but only 15 are used, and that is more than enough.

Therefore, all the stamped sheetmetal used in a car body can be designed by CAD. Actually, only 70 or 80 percent, the more complex, are designed by CAD, as Peugeot's computation capabilities are not powerful enough!

Undeniably, the structure is designed ultra-rapidly, but there is more than that to CAD. The quality of the project is considerably improved by its precision and rigor. The fact that everything is computed makes it possible to estimate the weight of the assembly and its inertia with great precision. The equations for each part are known, and they would not have been with a hand-drawn blueprint; therefore, a sort of mathematical prototype is already available and will later on be evaluated, refined, altered, improved... through the actual computation! This is paradoxical: the unlikely amount of computation required to design the structure is nothing compared to what will be required to estimate its strength, even if, thanks to the CAD "red thread," the meshing of design drawings is used as a basis for finite element computing, the second stage in the genesis of the prototype.

In passing, we should note how reliable the software used to design structures based on the engineer's intentions must be, for there is no room left for error. Should a weakness be detected in subsequent stages, it would be necessary to go back to the first program, improve it and start all over again, which would result in a loss of time and money that would cancel the advantages of using CAD. It is easy to understand then why engineers are bent on using the best programs and on creating them if they do not exist. Far from bringing the technical capabilities of manufacturers to the same level, as could have been expected since certain aeronautical and astronautical programs have become available, CAD intensifies competition: the computer will never do more that what men tell him to do, and the genius of the technical team is no longer demonstrated by one model, but by a whole family...

[16 Sep 82 pp 6-7]

[Excerpts] In designing a prototype, therefore, the engineers went from an initial styling model to an outer-conformity model which actually is merely a concrete representation of a mathematical prototype, the actual embodiment of an infinity of points computed from complex equations. After designing the inner sheetmetal structure, installing the mechanical components--and after much computation--the designer has managed to define the entire structure of the new vehicle.

Despite the reliability of CAD programs, nothing can replace the experience gained on a solid sheetmetal prototype: therefore, several such prototypes

(often incomplete at the start) must be built but, before that, why should we not take advantage of our immaterial, purely mathematical prototype to start testing and correct possible errors?

As a result, the meshing defined during the first stage of genesis will be used as a basis on which to compute the structure using the method of finite elements.

Finite Elements

This computing method is based on an operation called "discretization," which consists in dividing the structure into simple elements and in expressing the equilibrium of all these elements using the energy theorems.

Meshing, i.e. the division into discrete elements, and computation preparation are performed on a small local computer: since the result will be an equation system with 10,000 unknowns, the computation proper will be performed later on by the big Amdahl V8 computer. But what are the rules that must be applied to divide the structure into small plane (triangular, quadrangular) or tridimensional (tetrahedral or hexahedral) elements? To say the truth, it is at this stage of designing that the human factor, the engineer's more or less inspired intuition, plays its part, for, when all is said and done, there is no absolute method. Depending on his experience, the designer will find a more or less practical and clever way of dividing his system for computing, but one thing is certain: the finer the meshing, the greater the number of small elements into which the large part is divided, the lesser the risk of error. Therefore, nodes are concentrated in the more heavily loaded zones of the structure and, in some cases, they must be further divided using a smaller size meshing.

Then, inside the computer and using computation, forces will be applied to the structure and its deformations computed. The deformations displayed on the computer terminals are considerably enlarged, up to 1,000 times! Thus, as a body shell seems to twist under torture, its movements and vibrations have fortunately nothing to do with reality, otherwise we would have cars made of something like rubber!

The division into elements, the selection of the nodes, the recording of their coordinates, their assembly and numbering is a long and fastidious operation, but the results are worthwhile. The computations performed on the very large computer using NASA's general NASTRAN program or the specific SAM program, is followed by the no less important reduction stage in which deformation equations and stresses highlight the quality of the structure. If, on the contrary, it reveals weaknesses or can be improved, the operation is started all over again with new structures which again must be meshed so as to increase the control over strength and the reliability of the future car.

The most spectacular improvement, however, remains that of the initial structure design. Since it was designed by a computer, it might be assumed to be perfect from the start, but the engineer, still using the same computing program, can still improve its characteristics to a large extent by modifying a few of them. Thus, a side rail with a bending rigidity of 1 and a torsional

rigidity of 1 for a mass of 1 can be redesigned to a mass of 1.02 (a minimum weight increase) with a bending rigidity of 1.16 and a torsional rigidity of 1.35!

Other figures show both the validity of computing the frequency characteristics of each component and the maximum rigidity obtained through computing.

Another instance of computation shcws that a flat body bottom with a frequency of 16.9 Hz would buckle; a different design with ribs giving a good rigidity to the assembly will increase the frequency to 77.8 Hz!

Beyond Mechanics

Finally, an engine cradle (a major assembly including 10,000 degrees of freedom, i.e. as much as a complete body shell) went through 8 successive designs. The computer would compute its deformations during braking at 0.8 G and maximum acceleration in low gear: the mere removal of certain elements and a change in thicknesses (using the same material) resulted in a saving of 1.4 kg of steel out of a total of 7 kg! According to the technicians, they could have gone still further, but they always have deadlines to keep: at Peugeot, this computing power was used primarily to lighten the structure; today, under the accelerated model renewal program, they are essentially concerned with working fast... and they manage to do so.

Reliable and perfectly under control, the finite element method is extending its range of applications and proves powerful in helping design engineers. As far as mechanical strength is concerned, for instance, it can deal with the new plastic and composite materials and with non-linear problems.

It is also used for:

- thermal characteristics, with the difficult computation of thermal fields;

- acoustics, to determine the modes of vibration of empty bodies;

- aerodynamics: the beginnings were encouraging, but the problem is so complex that today's most powerful computers appear ridiculously inadequate. We shall have to wait another two computer generations...

- lubrication: to predict the transmission of efforts;

- combustion: work is in progress, but it is still very difficult;

- engines: the benefits are not as large as in the case of structures. Computations can be made only from a "hand-made" blueprint and it is impossible to go on straight to manufacturing (as is done for stamped parts).

However, one of the most promising developments of CAD is the determination of the behavior of structures under impact. As we shall see, this is one of the strong points of the Peugeot team since, in certain respects, it can be said to have achieved a world first, the invention of computer-simulated testing.

Forecasting

International safety standards require many impact tests to demonstrate that vehicle structures will adequately protect passengers in case of an accident. In addition, the engineer must consider small and medium impacts and how to repair them most economically.

In other words, all that has been defined and computed until now can be thrown back into question. Fortunately, our division into designing stages is entirely hypothetical; in practice, designers continuously synthetize the various constraints. Understandably, it is not easy, and the whole merit of design departments resides in their ability to combine solutions resulting from sectorial studies as diverse (although connected) as:

- layout of the components and of the car interior; outer shape;

- adequate rigidity in operation, vibrations, low-frequency noises and subjective feeling: it should be said that, although flexibility would make the engineer's task easier, it is excluded because the consumer equates it with fragility.

- corrosion;

- feasibility, forming and assembly;

- and, of course, cost.

With respect to impacts, studies are made along two parallel directions:

- finite element computing, i.e. computer-simulated testing, and

- computer-assisted testing.

For instance, consider a side-piece (the front structure supporting the drive-train and suspensions); three aspects of it can be studied through computations:

1. its behavior under a "bumper" effort;

2. the localization of the initial deformations (cost of repair);

3. the analysis of its energy absorption capacity (violent impacts).

The computation approach is standard and, of course, starts with the numerical definition of the part, which is divided into a finite element model with a very fine meshing of 2,221 elements, 1,700 nodes, i.e. 10,200 degrees of freedom. In this computation, nothing is omitted, not even welding spots, contact points and a representation of the structure plasticity...

Equal to 15 Cars

After that, the step-by-step computation of compression begins; as we shall see, it is a Herculean task representative of the power of present-day computers. For each step, and there are 15 of them, the new part characteristics are computed (since the part shape has changed because of contacts and plasticity variations), then the efforts and the compression immediately afterward.

Considering the 10,200 degrees of freedom (the same number as in a full body shell), the V8 computer takes half an hour for each step and, since there are 15 steps, it takes 7-1/2 hours to complete a task that would be nearly impossible on a human scale.

Thus, the following are determined

- the effort/deformation curve, especially the maximum effort;

- stresses throughout the part;

- deformations, zones of weakness which will have to be repaired after an average impact.

The most important fact, however, is that the order of magnitude of the deformations has been determined and their qualitative fidelity verified by a comparison with those observed in actual tests.

Thus, for the first time in the world, Peugeot can simulate impact on a computer and thus accelerate, and increase the reliability of, structure design. This performance was made possible by the purchase of the very large Amdahl V8 computer and the engineers' skills in achieving an ever finer and cleverer meshing, thus proving that Fiat's design department was wrong when it concluded that impact simulation was impossible.

What does qualitative fidelity give to the technicians? Side rails, for instance, are shortened after an impact: the deformations expected were found where they had been expected, and in the same order. Thus, we know where--and between which welding spots--sheetmetal will bend.

Equal to 70 Cars

While we are at it, why not quantify deformations and the deceleration law, this progressive compression, this dispersal of energy which saves passengers' lives? At Peugeot, they hope to achieve this, all the more so--as we have already explained--as robots now provide more uniformity in the strength of welding spots, which makes them more suitable for mathematical processing. The trouble is that each step takes as much time as it takes to compute a whole body shell and that it will take a total of 70-80 steps, compared with 15 today; nevertheless, this is the price to pay to go from qualitative testing (which is becoming common and generates savings) to quantitative testing.

Another factor militates for the generalization of computing, namely the introduction of new materials. Thus, the Vera design required the use of SMC [expansion unknown] plastics, i.e. expensive molds that take a long time to make and cannot be modified: for these obvious economic reasons, they had to be right the first time and computing made that possible. On the Vera, as on all future cars, the weight too must be optimum. On the Vera, the doors are lighter by 35 percent, but just as strong, as was shown by a front impact test at 30° (simulating an actual accident). The programs, therefore, can "digest" materials other than steel and can use their qualities to draw new parts.

As a result, computer-simulated testing results in considerable progress and enormous time-savings in everything that has to do with the safety and weight of future vehicles.

Computer-Assisted Testing

After simulation, computer-assisted testing (CAT) is a profitable extension of computer-aided design. On manufacturers' catapults and launching pads, entire vehicles manned by sophisticated dummies are sent to crash against obstacles. On each dummy, three accelerations are measured for the head, three for the thorax and the pelvis, two efforts for the femur, one for the belt, and one "submarine" effect criteria (when the body goes under the lap belt), i.e. 13 ways per dummy. If you add the structure accelerations and the "buffer" efforts, that makes 72 ways of measuring: since the operation lasts only 150 to 200 milliseconds, and since the signals are memorized at the rate of 8,000 points per second for each way, a total of 500,000 data per second are thus recorded in real time on 1-inch wide magnetic tape moving at 60 inch per second, i.e. 180,000 bits per second. It is obvious that such a mass of data cannot be exploited except by a computer. The computer memory then provides figures in the form of graphs which are so accurate that they can be used to derive criteria for damage to the human body: if the damage is too great, the structure is improved... until tolerable thresholds are reached. Thus, the testing computer is directly responsible for the improvement of vehicle safety, in spite of the increasingly reduced weight of vehicles.

A Jack of All Trades

When all is said and done, the principle of CAD is universal: as long as we have memories (which is easy) and adequate computing power (for that we must rely on computer manufacturers) as well as consistent programs (they are made to measure), almost everything is possible. As a result, ergonomic problems (how to make a driving station that will suit people of extremely varied heights), problems of visibility from cars (including the rearview mirror field) are now solved by CAD. The new 305 models, including their dashboards, owe everything to these techniques which, it must be said, have been experimented for a long time. Let us add that the Vera made it possible to perform a last rehearsal of all these techniques and that its success has demonstrated their validity and formidable effectiveness.

Thanks to CAD and the mathematical prototype, that phantom consisting of innumerable equations, that "red thread," designing has become much more rapid, infitinitely more precise, and connects directly with machining equipment. Since data processing is also the language of robots, we cannot help dreaming of a prototype that would merely be defined and drawn by man and would be delivered complete and completed by the multitude of computers and robots that would have created it.

A utopia? Certainly not; we are much closer to this solution than we imagine: it will result in a levelling of techniques "at the top"--which will benefit the consumer--but will increase the importance of the initial choices--definition and style--and therefore that of the designers. Is not this what counts?

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CSO: 3698/58

BRIEFS

ITALIAN FUNDS FOR ATR-42--A first series of credits amounting to 17 billion lire (approximately 850 million French francs) will be made available to the Italian national company Aeritalia, a member of the IRI [Industrial Reconstruction Institute] group for the development and construction of the French-Italian commuter aircraft ATR-42. On the French side, the ATR-42 will be manufactured by the national company Aerospatiale; it should be placed in service starting in 1985. It will have 42-49 seats and will be designed as a commuter aircraft. The project has already received orders and options for approximately 70 units. Market studies show that world demand for this type of aircraft will reach 2,500 units during the present decade. [Text] [Paris LES ECHOS in French 26 Oct 82 p 10] 9294

COMPANY READY TO SUPPLY PARTS FOR ATR-42, A-320--On 23 September, SAMM [Motive Power Machines Applications Company] held a press conference at its Vernon plant; at this press conference the company (since 1976 a member of the Peugeot-Talbot-Citroen group) emphasized its defense and aeronautical activities. SAMM's aeronautics department accounts for approximately 30 percent of the group's total activity; it produces servocontrols, stick hand-grips, monometric switches, pumps and electric pumps. As far as weapons are concerned, it is involved in particular in the development and production of turrets for armored combat vehicles and surface ships. Quite recently, the company--which has a strong position on the market of civilian and military equipment for civilian and foreign aircraft (planes and helicopters)--was chosen by the economic interest group Commuter Aircraft to supply flap-jack hydraulic control blocks for the French-Italian ATR-42. These are computer-controlled jack-supply systems. As far as the A-320 project is concerned, SAMM has just signed a cooperation agreement with Dowty. According to one of the technical managers, "through this agreement we intend to acquire a European dimension and the means to prepare us, industrially speaking, for the next generation of aircraft which Airbus Industries is expected to develop." SAMM's 1981 global sales after tax amounted to 290 million francs, including 65 percent of export sales. [Text] [Paris AVIATION MAGAZINE INTERNATIONAL in French 15 Oct 82 p 56] 9294

CSO: 3698/51

END

JPRS 82451

13 December 1982

West Europe Report

SCIENCE AND TECHNOLOGY

No. 130

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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JPRS 82451

13 December 1982

WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

No. 130

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THOMSON STOPS PRODUCTION OF IC MANUFACTURING EQUIPMENT

Paris L'USINE NOUVELLE in French 21 Oct 82 p 83

[Article by Jean-Luc Austin]

[Text] No integrated circuits without wafer steppers or electronic maskers. Cameca, a Thomson subsidiary, had succeeded in overcoming the American quasi-monopoly on these machines. Its decision to stop their production is thus even more surprising.

The fabrication of integrated circuits requires know-how, but also specialized machines, particularly wafer steppers and electronic maskers. Within the Thomson group, Cameca, subsidiary of the "communications" branch, had been charged with the development of these machines so as to gain freedom from the American quasi-monopoly in this area.

Today, however, Thomson wants to discontinue this activity; an announcement is even supposed to have been made to the personnel involved (about 500 people). This decision is the more surprising since two prototype machines perfected by Cameca are ready for delivery: an electronic masker for Leti (Electronics and Data Processing Laboratory), and a wafer stepper for DCI, the Thomson division which manufactures integrated circuits.

Although Thomson does not intend to explain the reasons for its decision, the creation of a joint subsidiary plant of Matra and the American company GCA (2500 employees, 281 million dollars in 1981) to manufacture this type of machines, does not appear to be unrelated.

European Market Too Restricted for Two Large Producers

A second explanation for Thomson's decision is that there is no room on the European market for two large manufacturers. And Matra is aiming very high: its plant in Nantes will employ nearly 1000 people in 1985. This will be the fourth settlement in Nantes, of the group led by Jean-Luc Lagardere, after MHS, LTI Stratifies, and Euromask.

The third reason is Thomson's difficulty in financing the industrialization of these machines. While an industrial electronic masker is not very different from a prototype model, the same is not true for a wafer stepper, which is used intensively in production. The industrialization cost for Cameca's machines would come to nearly 250 million francs over a five year period. However, this investment is still conceivable beyond the imperatives of technologic independence, since Cameca hoped to control 10 percent of the world market for these machines in 1985, estimated at some 800 million dollars.

Cameca had even bet on market growth by developing an X-ray wafer stepper with a performance ten times that of the current models. This technologic advance had even been blessed by the government last May, when it considered that Matra should perfect the current machines and Cameca those of the next generation. And although DIELI (Directorate of Electronics and Data Processing Industry) at the Ministry of Research and Industry, today declares that this sector of activity should be developed, in particular for electronic maskers, Thomson has rejected this "national division of labor."

An unplanned but saddening consequence of these maneouvers is that French integrated circuits will henceforth be manufactured on American technology machines.

11,023
CSO: 3698/50

ERICSSON TO REORIENT EFFORTS TOWARD DATA PROCESSING

Paris ELECTRONIQUE ACTUALITES in French 22 Oct 82 p 9

[Article by Ph. Marel]

[Text] In announcing during a press conference held in Paris on 14 October, that the data processing subsidiary of the Ericsson group, Ericsson Information System (EIS), was on its way toward financial equilibrium this year, its president, Mr Ledin, provided some details about the reorientation of the group from telephones to data processing.

In recent years, Ericsson has had to face a crisis in its telephone activities (new deals on its captive markets, increasingly stiff competition on open markets, and necessary reconversion of electromechanical products to electronic systems).

This crisis has resulted in a reduction of 20,000 people in production personnel, bringing the number of employees at Ericsson this year to 70,000 (for a turnover of 17 billion francs).

Another consequence of this crisis has been the need to reorient the group's activities toward other sectors, among which data processing. The creation of ESI, a subsidiary specialized in data processing, is the essential part of this reorientation strategy.

ESI, whose turnover should reach 3.5 billion francs this year, and whose accounts are expected to be balanced, will eventually provide the largest portion of the Ericsson business.

Created last January from a merger of Ericsson's computer peripherals activity and the activities (minicomputers, terminals) of the Datasaab company, acquired in April 1981, ESI should find itself expanded by the Facit company, specialized in office equipment, which is being bought from Electrolux.

ESI will thus have extensive capabilities in a field which is destined to undergo the highest growth between now and the end of the decade: office automation. With the combined know-how of these companies, Ericsson expects to soon offer systems for integrated text and data processing.

It is possible to ask whether this strategy oriented toward office automation, has not been selected a little too late. The market appears to be very competitive, especially against such manufacturers as IBM, DEC, and Wang, who have been sharpening their weapons for several years. Added to this is Ericsson's hesitation to adopt the local network option, which at present is a handicap since this technique rests at the foundation of the development of office automation.

Bright Future in France

In any case, the French market nevertheless illustrates an aggressive attitude on the part of the group.

Ericsson, whose telephone activities were taken over by Thomson nearly five years ago, returned strongly to this market only after buying Datasaab.

The goals of Ericsson France were outlined by Mr Lacombe, its chief executive.

The company expects to double its turnover, from 50 MF in 1982, to 100 MF in 1983. This figure should reach 240 MF in 1985, and the number of employees (100 at present) should grow similarly.

Lastly, the French subsidiary of the group will reach its profitability threshold after having crossed the 150 MF turnover point, that is, in 1984. The essential commercial business of EIS France will be based on the distribution of the IBM-compatible Alfaskop terminals, which the company plans to sell primarily in the private sector.

11,023
CSO: 3698/53

MICROLITHOGRAPHY TECHNIQUES SPOTLIGHTED AT CONFERENCE

Paris ELECTRONIQUE ACTUALITES in French 15 Oct 82 pp 1, 18

[Article by F. Grosvalet]

[Text] The eighth international colloquium on microlithography, Microcircuit Engineering 82, held in Grenoble last week, attracted an exceptional number of participants. 370 people from 14 countries attended this conference, with three large foreign delegations representing the United States, Great Britain, and the Netherlands.

The French delegation of 200 people revealed the interest that our country has in micrographic techniques. This was also made evident last year during the first national colloquium on dry etching (see ELECTRONIQUE ACTUALITES of 4 December 1981).

The 82 version of the Microcircuit Engineering colloquium, which has been held in Europe once a year starting in 1975, was followed with close attention by a very "studious" audience. There were five original presentations given on the fields of lithography by ion beams (including a presentation of the first structures developed by this technique) and by x-rays, and on resins-sensitive layers.

In addition, the organizers of the colloquium (SEE [Electronic and Electrotechnical Society], GIEL [expansion unknown], and SITELESC [Electronic Tubes and Semiconductors Industries Union]) emphasized "the essential and strategic role" of microlithographic materials, whose worldwide market in 1985 was $380 million, a figure which should double by 1985. Although it is hard to draw any definitive conclusions from this colloquium (and it was not intended that any such conclusions should be reached, as this conference is intended to present new developments and disseminate information), we can nonetheless discern a general trend toward an "association" of all the procedures. The semi-conductor

industry which now uses all the lithographic techniques available on the market, should continue to do so (as they all have their own advantages and disadvantages) and will adopt new techniques as they show what they can do.

Optics Remains Highly Competitive

For this reason, optical lithography, far from being displaced, remains highly competitive, particularly through the results obtained in the field of deep UV [ultraviolet]. Electronic masking is beginning to work well; its major drawback is still its cost. The two techniques of the future--lithography by x-rays and by ion beams--are moving ahead slowly but surely. For x-ray lithography, there is now the expectation of a no longer very distant appearance of "cheap" sources (resulting from the use by a French laboratory of a mini synchro-cyclotron). The ion beam technique, which has the same disadvantage of cost as electronic masking, does appear to have potentially greater performances than the electronic masking technique, because it offers the possibility of wider combinations.

In related fields--resins-sensitive layers, etching and inspection--there have also been some developments, but nothing very revolutionary is happening now. In the field of resins, though, specialists are now looking forward to the arrival of the first resins for deep UV. This should help to maintain the competitive position of optical lithography.

The Grenoble conference was organized in eight sessions: five on lithography, one on inspection, one on etching, and the final session on resins. There was also a round table session on radiation sources for microlithography.

Outside of the five lectures mentioned earlier, there were no truly exceptional presentations except for those on the brilliant results and high-quality work done primarily by the Japanese.

First Structures Developed by Ion Beams

Four invited papers (a report on the status of microlithography, inspection techniques by electron beams, modern etching techniques in microlithography, and resins in microlithography) provided information on the current state of the art, but did not provide any startling new information.

As we mentioned earlier, the session on optical lithography reported on some important work done in the field of deep UV

with presentations by IBM (rapid high-resolution lithography in deep UV using "excimeres" lasers); by Thomson-CSF/SML (the "exiplex" KrF laser as a future source in deep UV for optical projection); and by the Gas and Plasma Physics Laboratory of the University of Paris XI (device for the reproduction of masks in the V-UV [violet-ultraviolet] domain).

The session on electronic masking included a presentation by GCA [expansion unknown] of its rapid variable-spot system for direct tracing, the EB-7000.

For etching, despite the notable improvements made, much still remains to be done. It is becoming more and more apparent that practice is essential, both in the use of this procedure, and in terms of its inclusion among lithography techniques.

In the field of inspection, the users are beginning to be aware of the problem and are trying to solve it; so there might well be a revolution in this area one day.

In the field of ion-beam lithography, we were able to attend the Cambridge University (Great Britain) presentation on the first submicronic structures developed by means of this technique. To the best of our knowledge, this was a "first" anywhere in the world. The result is of particular importance as it has already been followed by some unofficial industrial applications.

There were new developments reported with x-rays, with the presentation of models which can be used to develop more economical sources. These included the model of the CEN [Nuclaar Research Center] at Saclay and of the CENG/LETI [Nuclear Research Center/Electronics and Data Processing Technology Laboratory, Grenoble] (a mini electron storage ring), along with the LURE of the University of Paris XI (a ring with permanent magnets). The last two original presentations covered the joint work done by the University of Ottawa in Canada and of IBM's lab in San Jose, California. These presentations were given in the session on resins. They covered the development of resins for distant UV by a chemical amplification mechanism and the use of this mechanism for the development of polymers which can be used as resins in lithography.

The eighth international colloquium on microlithography, which was just held in Grenoble, gave some idea of the amount of progress still possible in the field of integrated circuits. The above photos show two highly advanced structures developed by Siemens: to the left is a photosensitive lacquer etching; to the right is an MOS ring oscillator with 57 stages, in 0.5 µm technology (its propagation time does not exceed 100 ps).

7679
CSO: 3698/40

BRIEFS

THIN DISPLAY SCREEN--Goteborg--A thin, lightweight and energy-saving screen which does not cause physical complaints such as tired eyes and headaches is being developed at Chalmers. Two researchers in the Physics Department, Torbjorn Lagerwall and Bengt Stobler, are working with a data screen built around a new type of liquid crystals. These are faster than those used for example in the displays of modern minicalculators (LCD--Liquid Crystal Display). The screens made today utilize ordinary television technology. This has the result that more than half of those who now use screens regularly are affected by various complaints. Liquid crystals are actually organic fluids, the molecular orientation of which can be altered by means of electric fields, so that they either allow light to go through or shut it out. On the new screens the text becomes sharp and completely free from flicker. Further, it can be made dark on a light background, and it becomes sharper the brighter the room is, just as ordinary text on paper. /Text/ /Stockholm SVENSKA DAGBLADET in Swedish 27 Oct 82 p 7/
11949

3698

SWEDISH TESTS SHOW WAVE ENERGY PRODUCTION ECONOMICAL

Stockholm SVENSKA DAGBLADET in Swedish 22 Oct 82 p 6

[Article by Margareta Artsman]

> [Text] Wave energy has now become a more interesting energy alternative than ever. Tests conducted in Lake Lyngnern and outside Vinga for a number of years have confirmed that energy can be produced at a cost of 20 ore per kilowatt, which is a couple of ore less than energy produced from nuclear power plants now under construction.

This is according to the shipyard Svenska Varv and the consulting firm Technocean, which presented their findings at an energy conference in Goteborg last Thursday.

As an alternative to shipbuilding, Svenska Varv has seriously begun to focus on wave energy based on studies conducted by Chalmers under the leadership of Professor Curt Falkemo.

They now want to establish a wave-energy test site on Gotland, preferably on the east side of the island. Both municipal and rural councils on Gotland are supporting the project.

Patented

For confidential reasons, Svenska Varv does not want to give out too much information about the study. The key element in their wave energy production is a hose pump--the patented discovery of Jan Persson and Per Fredrik Troften. It is now being tested on a larger scale at a test station outside Vinga.

The wave-energy plant consists of a large number of buoys with the patented hose pump under each. The movement of the waves stretches the hose pumping water to the turbine, which in turn drives the generator.

The energy is conveyed to land by a 400-meter long cable. The size of the Vinga test station now in use is 30 kilowatts, sufficient to supply energy for five electrically heated homes.

"However, we are not testing output, but rather how well the construction can withstand the wind and the weather at Vinga," said Thomas Rindby with Technocean.

"Weather, among other things, is the reason for wanting to establish larger facilities on Gotland. We hope to do that by 1984-85," said Lennart Claesson, also with Technocean. "We aim to make use of existing harbor facilities and plants and to lay a 4 to 5-kilometer long cable, which will extend into suitable water.

Svenska Varv wants to find out if present calculations will hold up under large-scale tests. They feel that Gotland will be an important demonstration site. The cost of establishing a plant on Gotland with an output of 1 megawatt should be about 8 to 15 million kronor.

Hope for Money

The hope for money lies with the Energy Production Research Committee.

"The government made a mistake in cutting grants to wave energy research," said Lennart Claesson.

"That only means we might lose what has already been invested. It is important to continue the basic research so that we can move forward with out work."

The reason Gotland is more interesting than the west coast with respect to establishing a prototype plant is that fishing will not be affected as much there, weather conditions are better and that ice hardly ever forms southeast of the island.

8952
CSO: 3698/43

KUKA INDUSTRIAL ROBOTS COMPETE WELL IN WORLD MARKET

Hamburg DER SPIEGEL in German 25 Oct 82, pp 118, 120, 123

[Article: "It Is Beginning to Rattle"]

[Text] A medium-Size enterprise in Augsburg is one of the most important German robot producers.

The former warehouse way back in the corner of the industrial site of Friedberg near Augsburg does not look much like the factory of the future.

Heavy cast-iron pieces are scattered on the concrete floor. On wodden tables fitters are carefully putting together the heavy parts. Of all the tools that are being used, the most progressive one seems to be the monkey wrench.

It is almost unbelievable that the products of this well-established trade can be found by the hundreds on the most modern assembly lines of the European aotomobile industry: In the final assembly hall of the Kuka firm, approximately 60 workers are putting together up to 30 industrial robots every month. The automatic tools are welding the bodies of BMW and Daimler-Benz, of Ford, Peugot, Alfa Romeo and British Leyland.

The successful product of the firm is a large orange monster of approximately 2 meters. It resembles an antiaircraft gun rather than the machines used in the film "Star War." As far as the history of the development of robots is concerned, the "Kuka IR 601/60" will probably be remembered as a rather crude but vigorous ancestor.

At any rate, with its iron arm extended, the IR 601/60 can lift 60 kilograms. Its joints, each driven by an electric motor, can turn on six different rotational axes. It lends an amazing dexterity to the 2.2-ton gun: It moves its iron fist, called a lantern, at a speed of 1 to 2 meters per second.

Because of a computer-control system which switches motors on and off intelligently the IR 601/60 can reach any given point between the floor and a height of 3 meters and at the same time totate almost a complete circle.

According to the prospectus, the Kuka robot is condemned to operate with "practically no free play"; it follows its preprogramed course with constant precision: The deviation is guaranteed to be no more than 1.2 millimeters.

Because of these characteristics, the Augsburg automat captured a leading position among the German avant-garde robots. About 20 percent of approximately 2,300 industrial robots in the FRG originate with the Keller and Knappich firm, which calls itself Kuka.

Thus, following the Volkswagen Works--which maintains a market share of 25 percent--Kuka is the biggest German robot manufacturer.

But Volkswagen does not count as a competitor. To date all attempts of marketing VW robots outside its own firm have met with little success. The major customers of the robot industry are automobile manufacturers and they are simultaneously also VE's competitors. They are not very willing to give VW a detailed insight into their planning--something that is necessary for the installation of robot assembly lines for new models. Consequently Wolfsburg builds its machine monsters only for its own consumption.

As a result the Augsburg enterprise has to deal primarily with foreign competition. The leaders on the world market are Unimation, a U.S. company, and Asea, a Swedish enterprise; they are getting as many robot orders from FRG companies as Kuka does.

The Augsburg company reached its top position among German robot manufacturers by producing machinery that can perform precise work even when the load is heavy. Particularly in spot welding, the joining of body parts in the automobile industry, the welding instrument must be applied precisely at the same locations.

At first even Unimation's robots were not up to this task. The enterprise, which had been established by the inventor Joseph F. Engelberger (share of world market: 40 percent), offered the first robots for industrial production toward the end of the 1950's.

In 1970, when Daimler-Benz wanted to use robots for the first time for one of its welding lines, the instruments that had been selected almost collapsed. Kuka, theGerman company which represented Unimation at that time, rebuilt the American robots so they could do heavy work.

"It was the hour of birth of our own robot development," Stefan Mueller, product manager for Kuka's industrial robots remembers.

It was a difficult birth. The first mechanical robot madein Augsburg--it was called "Famulus"--was simply "not marketable" (Mueller). Due to a fundamental construction defect, "Famulus" suffered from a "nodding effect": The arm of the robot consistently tilted from its projected position.

For a while the robot development at the Kuka plant progressed only slowly, because it had little money of its own for research.

Kuka is part of the Industrial Works Karlsruhe Augsburg Corporation (IWKA), which is showing losses for most of its operations. The mixed concern of the industrialist family Quandt combines under one roof a strange conglomeration from steel bottles to antitank mines. Garbage trucks, for instance, also operate under the name of Kuka, and the firm supplies the turret for the Marder, an armored tank.

Burkhard Wollschlaeger, the member of the IWKA executive board responsible for the Kuka Welding Equipment and Robot Company--which in the meantime has become an independent legal entity--did not promote the development of robots until 1978. Since 1980 the sale of robots has doubled every year; now it amounts to approximately DM 70 million.

Nevertheless, little money is to be made from the sale of these robots that cost between DM 250,000 and DM 350,000. This year, however, Mueller, the manager of the robot division, hopes for a "small profit." Kuka and the other robot manufacturers still have to invest large sums of money in new technology.

To date robots have presented little competition to the worker but to those machines which for a long time have produced the most important sales for the Wlding Equipment Company: Industrial robots are replacing automatic transfer lines in the automobile industry.

To date the welding of bodies on conveyor belts along assembly lines has been done by "numberically"--using perforated taptes--controlled machines. This equipment, however, can only be converted at great expense, for instance, when new models of automobiles are to be manufactured.

Robots are much more flexible: At the touch of a few keys on the computer keyboard a completely new procedure can be programmed. A robot welding line can even process different body models in a random arrangement. A sensor tells the robot what task needs to be performed at a particular moment.

The know-how of transfer line technology gave Kuka an advantage over many other robot manufacturers who do not know their way around the automobile industry that well.

Good relations with automobile producers continued to help sales. The biggest Kuka customer is BMW, where 200 robots are employed. Like Kuka, a majority interest in the Bavarian Motor Works belongs to the Quandt family. Eberhard von Kuenheim, the head of BMW, is the chairman of the board of directors of IWKA.

There are also close ties to Daimler-Benz. The Kuka garbage truck bodies, for instance, are attached to Mercedes truck chassis.

By the mid-1980's, however, all European automobile manufacturers will have completely outfitted their welding lines with robots. To date approximately 90 percent of Kuka's robot sales have been destined for this market which will then be saturated.

Robot producers like Kuka are therefore looking for new areas of use for their iron colleagues.

In the German branch of Unimation in Heusenstamm near Frankfurt, for instance, robots are being trained for new tasks in the food industry. Unimate robots are practicing by restacking Langnese frozen foods on pallets and putting chocolates into boxes. "Many things are beginning to happen," Norbert Schlimm, Unimation's business manager, says with delight.

This second wave of robots, for which manufacturers are preparing right now, will for the first time replace jobs to a noticeable extent. In the past packing jobs, which are to be taken over ny robots, required a lot of muscle and to date there has been little automation in this field.

Schlimm of Unimation figured out that as many as 50,000 people in the food industry are loading pallets. His inadequate consolation: "We are endangering Turkish guest workers."

Within a few years, robots will also be able to do more complicated assembly-line work in the automobile industry. By that time sensors will be read for production that can control the claws of the robots.

Hans Jaeger of the Metalworkers Union, a labor union expert on automation, figures that approximately 1.1 million workers are involved in assembly-line tasks.

According to his estimates, between 200,000 and 300,000 workers could be replaced by industrial robots by the end of this century. By then at least 40,000 robots, the labor union leader states, will be in operation in German factories.

Robots manufacturers are more cautious with their predictions (between 10,000 and 15,000 industrial robots by 1990): Too optimistic predictions of growth might only increase the fear of the iron colleagues. But Kuka Chief Wollschlaeger is also counting on continuing "growth rates in 2-digit figures" for the robot market.

Nevertheless, it will be difficult for Kuka to maintain its share of the market. To date Augsburg's offer has been too limited, concentrating on heavy robot models for welding automobile bodies.

Market leader Unimation, on the other hand, is offering quite a selection--including robot dwarves that are no taller than desk lamps and which can be used, for instance, for tedious jobs in the electronics industry.

The Augsburg company barely meets the latest standards in computer control. The German Electro-Multi Siemens is supplying computers including software at proud prices.

The expensive control system is contributing to the fact that Kuka robots are among the most costly robots in the industry. Other major producers, on the other hand, developed their control systems--the brain of the robot--under their own management.

Compared to the big competitors on the world market, Kuka seems almost like a high-quality workshop with its crew of approximately 200 people who are working in Augsburg for the robot division.

Unimation and Kawasaki, its Japanese licensed partner, are producing around 200 robots per month--"as many as Kuka does in a year," according to a proud remark by Unimation Manager Schlimm.

8991
CSO: 3698/46

MACHINE TOOL INDUSTRY REGROUPS AROUND 'MFL'

Paris L'USINE NOUVELLE in French 7 Oct 82 p 82

[Article by Georges Le Gall]

[Text] Two new French machine tool companies were just created a few days ago: BS [Berthiez-Saint Etienne] and FL [Forest-Line]. These are two subsidiaries of the MFL [French Heavy Machines] holding company established on 3 September to bring together the activities of the former Berthiez (a SNECMA [National Aircraft Engine Study and Manufacturing Company] subsidiary) companies, St Etienne Machine Tool (which had been turned over by Ernault-Somua to the Line group), TMI [expansion unknown] (formerly Forest, which had been transferred to the control of IDI [expansion unknown], and Line.

BS will specialize in large lathes and FL in large milling machinery. Each company has a capital of 100 million francs, taken from the capital of the MFL holding company, which was 250 million francs.

Before the end of the year MFL, whose president is Louis Tardy and whose chairman of the board of directors is Pierre Lacour, will establish a technical and commercial structure on the east coast of the United States.

This move across the Atlantic is part of MFL's development program. The development contract signed between MFL and the ministry of research and industry calls for MFL (whose planned sales for 1983 are 590 million francs) to account for 6 percent of the worldwide production of heavy machine tools in 1986, up from 4 percent at present. This will be accomplished by investments of 200 million francs between 1983 and 1985.

In terms of personnel, contrary to what has been reported (see L'USINE NOUVELLE, weekly edition of 9 September 1982 page 57),

the staff of the four companies brought together into MFL will not be cut to 675 employees. In reality, the starting staffing level, which was 1,990 people, will be reduced by attrition, by such measures as early retirements and job reclassification: from 675, it will be brought to 1,315 people (675 at BS and 640 at FL).

Some hiring of specialized personnel is planned (in the fields of numerical control, industrial automation and data processing). About 20 people will be hired in 1983, and about 100 over the next 3 years.

7679
CSO: 3698/40

SCIENCE POLICY

MINISTER OUTLINES SWEDEN'S RESEARCH ORIENTATIONS

Stockholm DAGENS NYHETER in Swedish 8 Nov 82 p 14

/Text/ A new Government Research Advisory Board will be created in the government office building to advise the government on scientific issues.

This is what Minister Ingvar Carlsson, deputy prime minister, told TT /Tidningarnas Telegrambyra/. The mandate of the old Research Advisory Board, created by Tage Erlander 20 years ago, has expired.

"I want a Research Advisory Board which plays the role it had during Erlander's time," says Ingvar Carlsson, who is immediately responsible for the research. "We are now thinking of how to construct the new one. It is clear that it will mainly consist of researchers, but other persons as well can be included."

The new Research Advisory Board is an element in the efforts to activate Swedish research and development:

"My impression is that the old Research Advisory Board got off to a good start, but that the activity gradually acquired less practical importance. If you are to have a Research Advisory Board it must be full of initiatives and vital, otherwise it is of no use and can even do damage."

"We have indicated some areas of research which we believe are at the forefront," Ingvar Carlsson continues: "biotechnology, data technology, electronics and material technology, in which we believe Sweden could be among the foremost nations in the world."

"But in a democracy such as ours we should also have a broad base in social scientific and humanistic research, because it has a value of its own and because it is to form a foundation for more technically oriented research."

"Does Sweden today have a sufficient capacity of researchers or should it be expanded?"

"We have sufficiently many researchers, but not enough who earn degrees. We actually run a certain risk of having problems over the long run in filling the professorships in certain sectors. This is why we must see to it that in certain sectors there will be enough students choosing to go on to Ph D's."

"Do you want a greater exchange of international researchers?"

"Yes, I think that is exremely important. To be sure, Swedish research is at a high level, but we are a small country and consequently should be greatly interested in an exchange of research activity with other nations."

11949
CSO: 3698/57

FRG TO CONTINUE RESEARCH POLICY UNCHANGED, SAYS NEW MINISTER

Bonn RHEINISCHER MERKUR/CHRIST UND WELT in German 15 Oct 82 p 14

[Text] When the new Minister for Research and Technology Heinz Riesenhuber discussed the guidelines of his policy at a press conferencein Bonn a few days 4go some of the correspondents wondered whether the 46 year old bearer of a degree in chemistry was really a member of the CDU. The minister's formulation of the elements of his program could also have come from one of his Social Democratic predecessors. Riesenhuber's efforts to continue the former research policy, at least in its main features (together with the State Secretary Hans-Hilger Haunschild whom the new minister asked to stay in office), were unmistakable--he expressly emphasized that new courses of action should only be undertaken very cautiously.

The question about his membership in the CDU was, of course, asked purely rhetorically--Riesenhuber has been a member of this party since as long ago as 1961. He carries his membership for public display purposes so to speak, as if it were a correctly tied bowtie. When he was nominated as a candidate in the Bundestag elections of 1976, in fact, several CDU municipal districts also voted on whether Riesenhuber should be allowed to continue to wear this extravagant item of clothing. Permission was granted.

Heinz Riesenhuber, then district chairman of the Frankfurt CDU, member of the CDU presidium for Hesse and also technical manager of an artificial fibre company, succeeded in making the jump to the Bundestag. He became a member of the Committee for Research and Technology, headed the National CDU Committee of Experts for Energy and Environment and was already a sensation with his first speeches in the Parliament. His political opposite number at the time, Volker Hauff, research minister of the social-liberal coalition government from 1978 to 1980, soon recognized in Riesenhuber "the most important head in the opposition" as far as researcy and technology were concerned and called him a "computer brain."

Apparently the recognizition is based on mutual feelings since it is clear from the first statements of the new research minister that he intends above all else to continue Hauff's policies. For exaample, Minister Riesenhuber expressed support for a resumption of the dialogue on the opportunities and risks of new technologies which the last SPD research minister, Andreas von Buelow, considered of little effect, whereas Hauff regarded such talks and the evaluation of the technological consequnces as important.

Riesenhuber is of the opinion that the basic environmental requirements of a new technology should not be grafted on after the fact but should accompany the development of the technology itself and, in fact, in such a way that the technology and the establishment of the basic requirements be achieved simultaneously. Only under these conditions might one be able to expect that new technologies in an age of reason could be carried through publicly with reasonable, general acceptance.

Minister Riesenhuber sees basic research as one of the most important and central tasks of his regime. Basic knowledge gathered from basic research must, however, be made more rapidly available for practical application--a task which he would like to shift more strongly to the large research facilities (in doing so he is also thinking about having such centers and the private sector take up such projects jointly).

In view of the shortage of funds, however, Minister Riesenhuber also feels under an obligation to establish whether the large number of requested projects is "necessary and in fact rationally manageable." The goal of research should not be the completion of programs but rather the discover of key areas in which innovation and growth aOe possible and worth pursuing. At the same time one should always have in mind which delivery methods--direct or indirect--should be used in each case.

In contrast to his more skeptical predecessor, Riesenhuber would like to see the construction of both advanced atomic reactors, the fast-breeding reactor and the high-temperature reactor, carried to conclusion. The gaps in financing--in the billions--should not, to be sure, be closed either from the budget for research or from the general budget; here industry would have to make its contribution. He believes the conditions for greater commitment by industry in this area are especially favorable at this time: At the end of the month the studies on both reactors will be available, all important permits for component facilities are ready and the Parliamentary restriction against starting up the fast breeder will probably be gotten out of the way after the pro-breeder vote of the commission of inquiry in the near future.

So that he might be spared a disaster such as his predecessor had to endure with these two reactors, Minister Riesenhuber also inends to conduct a critical examination of nuclear waste disposal soon. This problem must be settled urgently and he is fearful that in this sector as well not all elements are assured as far as time and cost plans are concerned. Thus yet another study is being ordered. Thereby another characteristic of the new minister is noted: Even he has no intention of giving up studies and the reports of experts.

Hence even in this regard continuity in the administration of this ministry remains clear.

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BETTER LAB-TO-INDUSTRY TECHNOLOGY TRANSFER DISCUSSED IN BONN

Bonn RHEINISCHER MERKUR/CHRIST UND WELT in German 22 Oct 82 p 16

/Article by Michael Globig/

[Text] Engineers, politicians and manufacturers met in Bonn to discuss how cooperation between research and medium-size industry can be improved in the future

The accepted view that technical progress comes exclusively from large firms with corresponding research laboratories can no longer be justified. Rather, there is support for the conclusion that small and medium-size firms are superior to the large companies when it comes to contributions to technical progress. This was the conclusion reached by Richard Greiling, an industrial policy expert from Nuremberg in his dissertation entitled "The Contribution of Small and Medium-Size Companies to Technical Progress," which was recently published as volume 86 of Schriften zur Mittelstandsforschung (Reports on Mid-Level Research) by the Otto Schwartz Verlag, Goettingen.

Greiling substantiates his theses with examples of how mid-level companies "were successful with ideas" (the title of a series in the Frankfurter Allgemeine Zeitung, to which reference is made by the author). The spectrum ranges from Falk Verlag, Hamburg, with its specially folded city maps to the Werkzeugfabrik Rothenberger, Kelkheim (which expands the ends of pipes with an expanding pliers so that they can be joined to other pipes without an intermediate segment), and from the Otto Brentzel Company, Fischbach (which manufactures plastic-coated and corrosion-resistant concrete studs for highway construction), to Imchemie in Wermelskirchen, which presses acrylic resins into stone material for preservation.

Where does the impetus for technological progress come from in the small and mid-size companies that usually do not have their own research departments? One source is the twelve major research institutes in the Federal Republic. Here, in their work on basic

research or project-specific tasks, scientists repeatedly encounter usable processes and developments that might be of interest for industry. An accounting of the technology transfers from research institutes is of course meager, as was apparent in a symposium on this topic held last week in Bonn.

Although every major research center does have its own employee responsible for technology transfer, there are still many problems connected with contact with the mid-level firms, despite this sign of good will. Qual. Eng. Scheller, Kleindienst Machine Construction, Augsburg, mentioned a number of the difficulties: In the research centers, work is directed toward an area of specialization, but companies must be market oriented. Researchers develop their apparatus for laboratory experiments while companies must constitute them in such a manner that they are suitable for assembly-line production, for marketing and subsequently for scrapping. Scientists think about publication and about their own image, while manufacturers must think of sales and survival.

In view of these differing points of departure, if we then consider that researchers and manufacturers often speak two totally different languages, we can conceive how difficult cooperation can be, even when an idea has found its way to a company from a major research institute.

Scheller, who occasionally visits research centers and acquires in situ information on new processes and products, described an example of successful cooperation. His company, which makes machinery for laundries and car wash stations, was looking for a process to handle waste water so that it could be used again and not contribute to environmental pollution. He encountered a suitable technique at the GKSS Research Center, Geesthacht, which was used there for water purification in membrane set-ups to prevent these from being overgrown with algae. Working with the laboratory model, four engineers, two from the Geesthacht Research Center and two from the Augsburg manufacturer, developed an apparatus that can recycle up to four cubic meters of water per hour, which is the right size for car wash plants.

These new facilities were exhibited at last year's Hanover Fair, and the first licenses were granted. The machinery is currently being manufactured and the engineers are now experimenting with equipment that would handle the waste water from laundries, breweries, tanneries and dye plants, which is more difficult to process. The project is being supervised by former GKSS associate who switched to the Augsburg company, which is benefitting from his know-how.

In Bonn, Professor Schmidt-Tiedemann, managing director of the Phillips Research Laboratory in Hamburg, stressed that personnel transfers of this kind are especially suitable for conveying expe-

rience from research center to industry. However, such employment changes are not particularly popular in Germany as many scientists and engineers remain glued to their jobs because of an exaggerated desire for security. The electronic manufacturer Philips therefore practices employment alternation within the company -- with the added benefit of being able to utilize the advantages of personnel transfer, i.e. the liberation of creative abilities, without any social risk for those involved.

Professor Schmidt-Tiedemann suggested closer cooperation between both employers in order to make future employment change more acceptable. For example, employers might give joint consideration to the additional training required by an individual who intends to make a change and to how his new place of work should be set up.

However, it is not only the predisposition to mobility which is lacking in Germany, there is also very little inclination to take risks. In this country, researchers have not established around major research centers or universities the small and medium-size companies that are a natural accompaniment to laboratories or institutes in the United States. The medium-size microelectronic plants in the "Silicon Valley" of California (the area having been named for the basic material of all semi-conductor construction components), near Stanford University, is an example of this, as is the new genetic engineering firms being established on the east coast of the US.

On the other hand, to mention an example cited by Heinz Riesenhuber, the Federal Minister for Research, no genetic engineering companies have been established to date in the area near the Braunschweig Association for Biotechnology. And the situation is quite similar in areas surrounding other major research centers. For example, the Juelich Nuclear Research Institute can point to only one new company that has been established at its front door: A former KFA associate set up Reaktorwartungsdienst und Apparatebau GmbH /Reactor Maintenance Service and Apparatus Construction GmbH/, which manufactures apparatus for low-temperature and nuclear technology. Since this 30-man company is familiar with all of Juelich's requirements for special vacuum containers used in research and since it is also almost the only company that is in a position to fulfill these requirements, it is often awarded contracts.

Rolf Teenhaus, a board member of the Juelich Nuclear Research Institute, emphasized that, since the potential for centers is greater and since it ranges from measurement technology to electronics, medical technology and material research, and to new soldering techniques and genetic engineering, small and medium-size companies could do very well with an occasional glance at

the work of major research centers. Another speaker at the Bonn symposium indicated that, instead of waiting for visitors, the large research centers should open their doors more frequently to mid-level companies, and invite them to meetings and inspection tours.

Federal Research Minister Riesenhuber has asked the twelve major research institutes in the Federal Republic to devote greater attention in the future to economic conversion of the results of their scientific work. To promote this conversion process, he announced in Bonn that a 30,000 DM prize had been established for peak performances in technology transfer. This move shows that the Minister is serious about his request to unearth technological know-how buried in the major research centers and make better use of it.

Perhaps he might also consider in conjunction with Federal Finance Minister Stoltenberg how researchers could be encouraged to take risks and how scientists could be spurred to establish their own companies. Financial aid for starting companies, the awarding of public grants to newly established firms and lowered taxes for companies that for a limited period would enter a partnership for joint development of a project were some of the suggestions offered by participants at the Bonn Symposium

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